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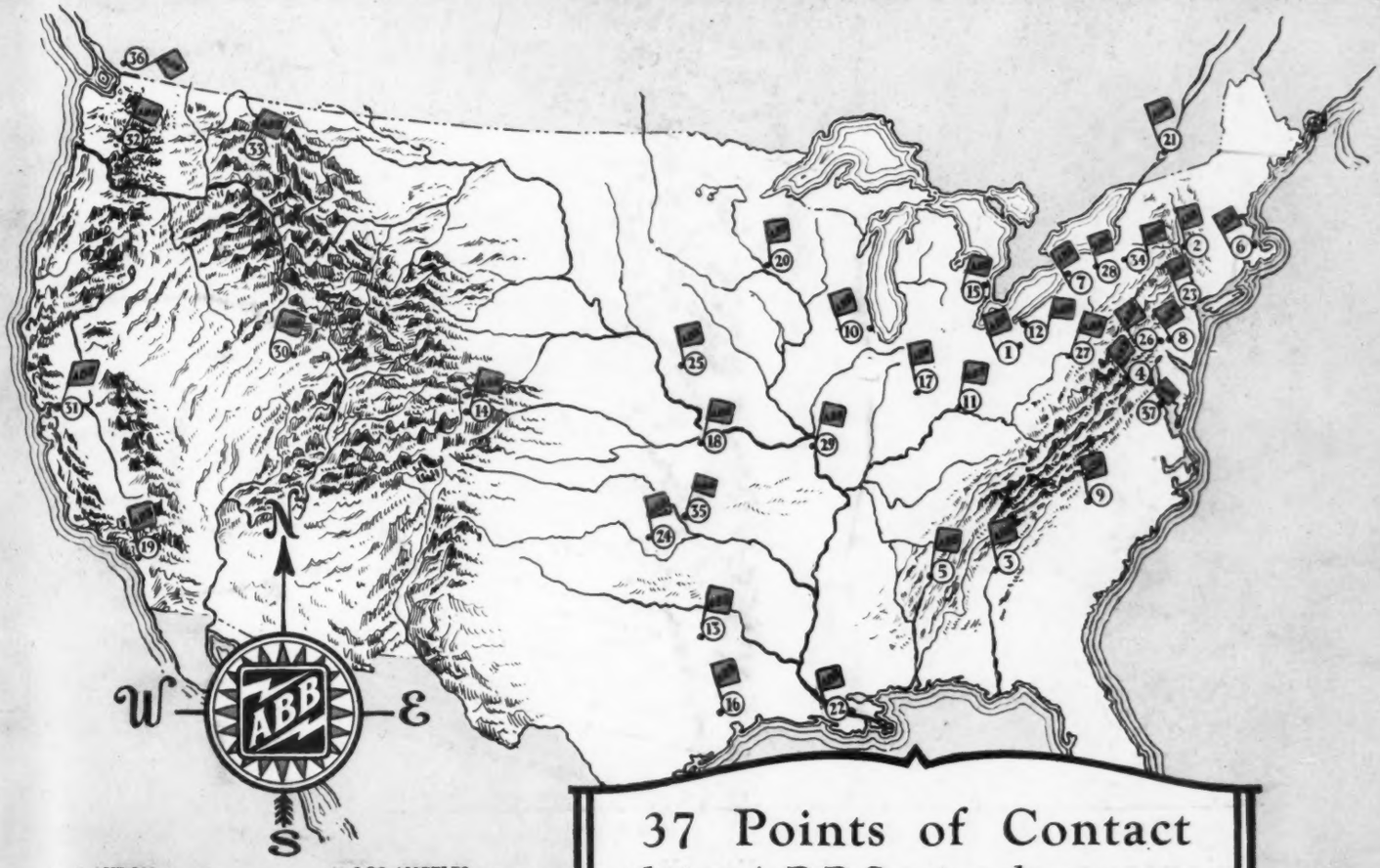

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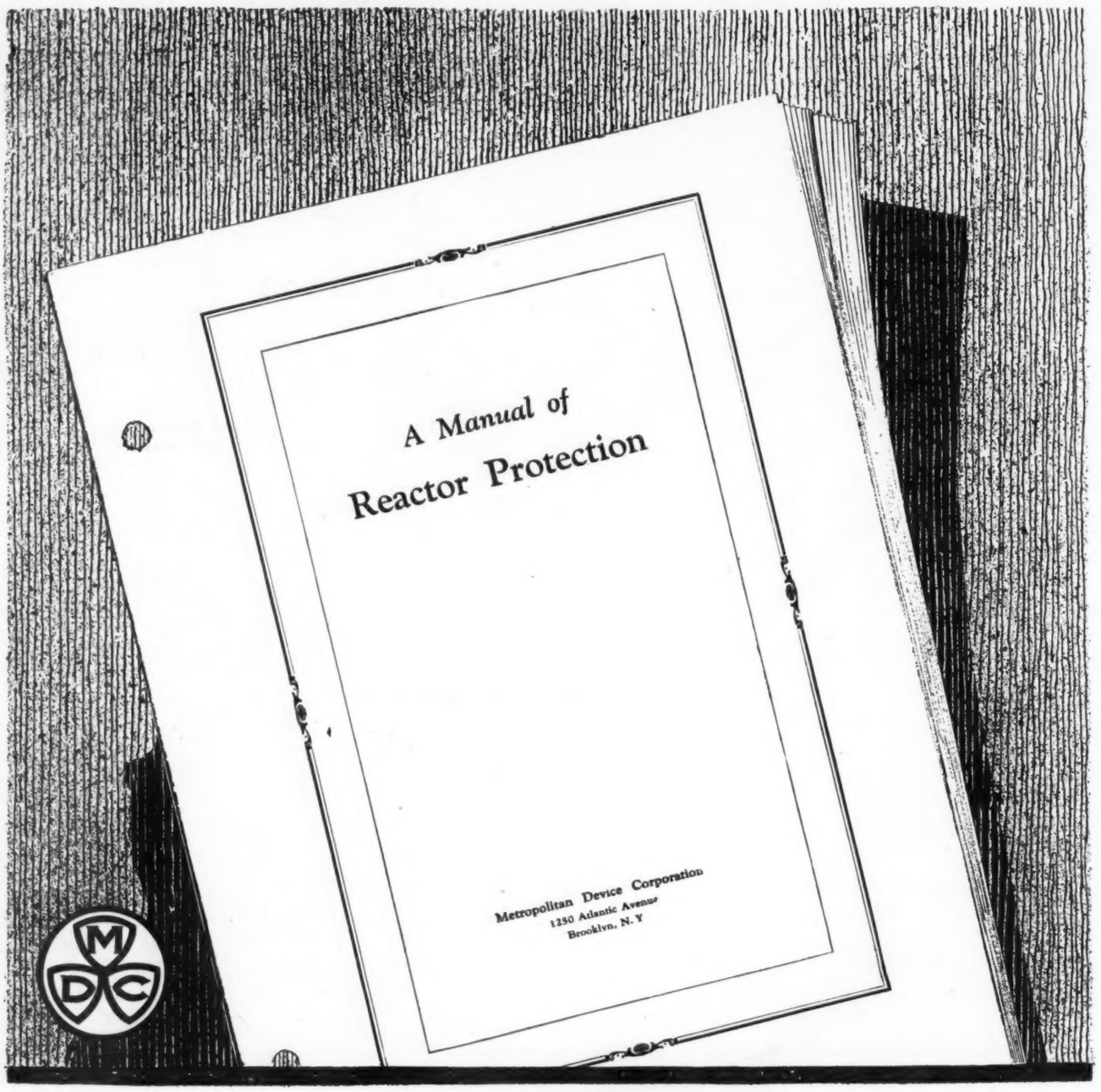

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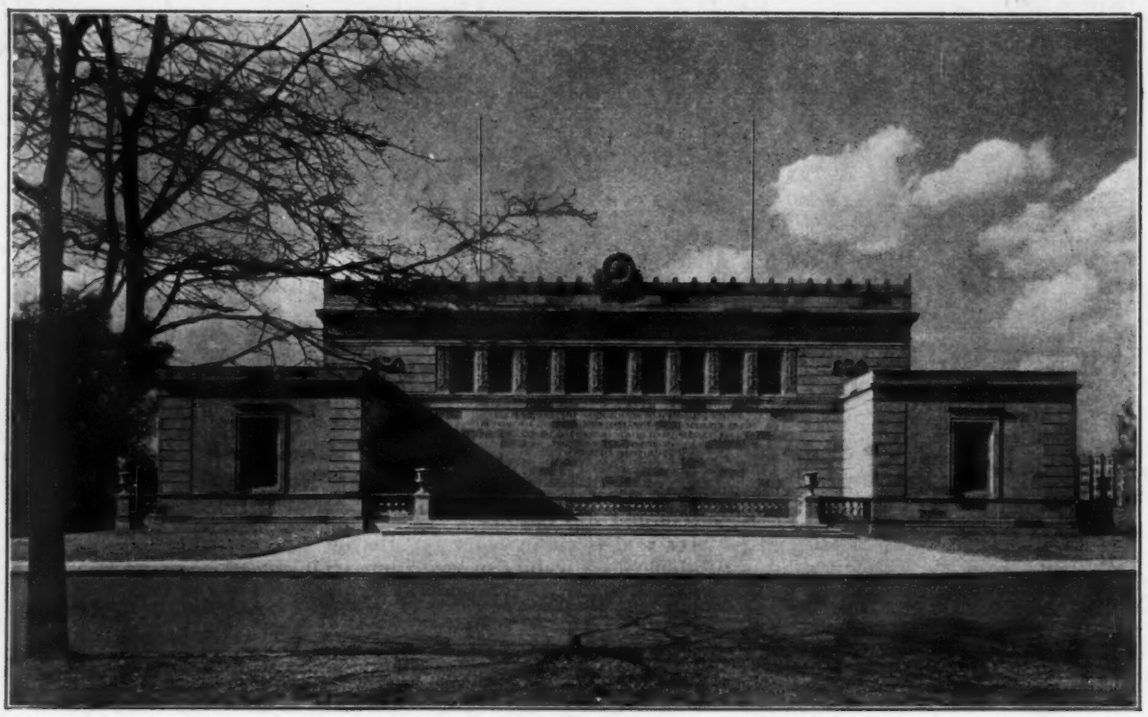

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Electrical World

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Editor

VOLUME 92 — *New York, Saturday, October 27, 1928* — NUMBER 17

Another Honor for Edison

CALLING the nation to attention last Saturday night, President Coolidge cited Thomas A. Edison for distinguished service and announced the award to him of a special Congressional medal. Then, in the inventor's famous New Jersey workshop, Secretary Mellon invested him with this richly earned bit of insignia while a chosen company, representing not only the electric light and power industry, not only the pioneers whose proudest boast it is that they worked with Edison in the early days, but also other fields of professional and commercial activity, applauded. Mr. Edison, forced in his later days from the lifetime habit of silence on such occasions, spoke in reply a few words of deep appreciation the sincerity of which no one who heard or who reads them could for a moment doubt.

It would be pardonable in the famous American who numbers his awards and formal tributes by the score to seem not greatly moved by this addition; but evidently the belief that it came, not from any group or class, but from his fellow-countrymen *en masse*, and that it spoke of their pride in his fame, their gratitude for his gifts to them and their affection for his person, went straight to the simple heart that beats in his uninflated breast. Not for Thomas Edison is the pose of

> The weary Titan, with deaf
> Ears and labor-dimmed eyes,
> Bearing on shoulders immense,
> Atlantean, the load,
> Well-nigh not to be borne,
> Of the too vast orb of his fate.

His rather is the buoyancy of noonday, of the man still at his daily task, of the octogenarian who refuses to dwell in the past or with his coevals only, but lives with his contemporaries, young or old, not by his own choice as an example and an inspiration, but as their comrade and their friend.

* * * *

Co-operation in Fuel Conservation

GREAT BRITAIN has been making a general survey of the fuel and power situation under the direction of the Board of Trade. The report of this committee is abstracted in this issue and contains some conclusions and recommendations of value to this country as well as to Great Britain. Fuel research is recommended and all industries are urged to exchange information on fuel technology. Purchase of fuels on specifications is urged as a constructive move. Each industry using fuel should, it is maintained, study its fuel problems and collect data on fuel use; the values in a network gas supply area fed from gas works, coke ovens and so forth should be found through an experimental installation, and the domestic fuel situation should be studied carefully.

In this country there is little economic pressure for fuel conservation, but there is a big financial inducement to use fuel and its products more intelligently. Many systems and methods to join together coke ovens, electric utilities, raw fuel, chemical byproducts and gas utilities have been proposed, but no authoritative data exist as to the technical and economic values of these combinations. With many at work on these problems and with all to gain, it will be well for the United States to carry out the co-operative work suggested as valuable to Great Britain. Organized effort can do much to expedite results.

* * * *

The Investigation and the Constitution

WITH the object of obtaining a speedy judicial determination of the constitutional and legal rights of the government, of the Federal Trade Commission and of the Electric Bond & Share Company, the company named has asked the co-operation of the Federal Trade Commission itself. The company claims that since the beginning of the present investigation, five months ago, it had continuously made available to a large corps of examiners a vast amount of material notwithstanding the great expense and inconvenience involved. Less than a year ago the Federal Trade Commission completed an exhaustive examination of the company's affairs and now its representatives demand the privilege of examining all books and papers of the company whether relevant to the present investigation or not. The Electric Bond & Share Company questions specifically the right of the commission to inquire into the details of its private business and professional undertakings for its clients, claiming that they are competitive in their nature and involve the disclosure of costs and transactions wholly private and confidential and not relevant to the subject of the present inquiry.

The power of the Congress of the United States to inquire into the private affairs of its citizens, individual or corporate, is expressly limited under the Constitution. As a matter of fact, the highest court of the land has on more than one occasion called attention to certain "fishing expeditions into the affairs of a stranger" which overstep the bounds of congressional authority. It is well, therefore, that the scope of the present investigation be fixed by a tribunal competent to pass on such matters. The Senate of the United States seems to be going in more and more for investigations. However justifiable these may appear to be, they should not be permitted to encroach on rights guaranteed under the Constitution. These should be safeguarded under all

circumstances, and in contending for its rights the Electric Bond & Share Company is performing a service, not only for its own stockholders, but for all industry.

No attempt is being made to stop the present investigation of the Federal Trade Commission, nor is its right to make an investigation questioned. What is being attempted is to keep the commission and its investigators from running wild.

* * * *

French Lessons in Illumination

THE Illuminating Engineering Society last week very wisely took its members on an inspection trip through that beautiful ship *Ile de France* to pay homage to French ingenuity and French art. A great deal has been said and written about the lighting of that ship, and some comments were heard about "crazy cubist stuff." Nothing is further from the truth. Most of the beautiful and correct lighting effects were accomplished by very simple means. There is nothing gaudy, nothing gingerbreadish, nothing extravagantly expensive.

As compared with the elaborate architecture and craftsmanship, the lighting installation is no doubt rather low in cost. One of the most striking features of the scheme is the virtual absence of fixtures—no candles, no chandeliers, no lanterns. Plain or cast-glass panels on ceilings or walls accomplish the greatest portion of the lighting scheme, all in such perfect harmony with the architecture and decorating scheme that when the lights are turned off there is hardly any evidence of lighting equipment at all. And there is a remarkable exhibition of the French artistic touch combined with the inborn French thrift in the fact that for all the wonderful and varied effects which are accomplished by cast glass not more than half a dozen patterns were necessary. Aside from the fact that the cove lighting and painting illumination could have been done better by one or two American firms, the fact stands out that we can learn a great deal from the French, not only in design, but also in the efficient utilization of a minimum number of designs in a maximum number of combinations.

* * * *

Possibilities for Reduction of Power Cost

THERE is nothing static about the engineering of power stations. Each cycle of development brings about remarkable economies and gains in thermal efficiencies. Cost data on representative utility power plants published in this issue show values far below those obtained only five years ago and thermal efficiencies far higher than were dreamed of in 1914. The power station and the cost of power from fuel-burning plants are now minor though important cost elements in large utility systems. The transmission, distribution and service elements are far larger and are on the increase and will continue to increase because voltage and service standards are getting higher and higher. And there seems to be no way to reduce these costs.

Despite the comparatively low cost of power production, however, the bottom has not been reached. The experiences of the past few years can be capitalized to make cost reductions in new designs, and beyond this there are new methods and equipments just coming over the horizon that are very promising. At the World's Fuel Conference held in London and reported in this issue very little that was new was presented on the power situation. The limiting factors that fix the pressure and temperature of steam are still present. The economic handicaps to joint enterprises to produce gas, carbonization, by-products and electric power are still large. Turbines, boilers, condensers and other equipment are regarded as well standardized in design. Therefore, only a rearrangement of existing equipment or the advent of new materials seems to offer much hope for major reductions in power costs.

But this is the pessimistic side of the picture. Water is not the only liquid that can be used in power production; the mercury-water combination is now a practical success and investigations are being made of other possibilities. In stokers and pulverizers there are new things in the wind that offer possibilities for cost reduction. In reheating, in turbine design, in boiler design, in condenser design and in station assembly there are ideas so worthy of investigation that there will be no cessation of research along these lines.

So long as a thermal efficiency of about 20 per cent only has been reached and so long as men generate ideas that may save dollars when applied to station design there will be no stagnation in power-station development. There is too much at stake to permit work to slacken. The present notable records of power-station engineers are but forerunners to their future achievements.

* * * *

Promoting Peace Through Inducement Rates

THE New Bedford Gas & Edison Light Company has emerged from a trying period in the industrial history of the famous old city which it serves with credit to its management and appreciation of its customers' needs. A widespread strike in the leading textile mills has ended after months of conflict. To assist the city in recovering from the effects of this disaster the company has announced a rate reduction amounting to $135,000 annually and has offered its 35,000 residential customers optional rates of the promotional type which will bring the cost of energy for home service down to 2.5 and 3 cents per kilowatt-hour for general appliance and lighting use after the demand and initial energy consumption requirements are met. Other reductions are offered in commercial lighting and power rates.

Apart from the interest of the rate specialist in particular schedules, there is no longer much novelty in the adoption of inducement rates by individual companies; but the action of the New Bedford company and the circumstances under which it took place are more than ordinarily significant. About a year ago the company retained a firm of consulting rate engineers to make a cost analysis of its service, and, as generally appears, it was found that many of the smaller customers were being supplied at a loss. Local demands were made upon the company to reduce its top rate from 8 cents (7.6 cents net), and considerable press hostility was alive all through the strike. The company "sat tight," preferring to play safe during the months of industrial distress which afflicted the community, though meanwhile studying the rate problem with earnest attention. The new optional schedules were worked out, explained in

detail to the press, filed with the Massachusetts commission, approved without objection, finally announced in full-page spread and news stories comparing the older and newer rates under a wide variety of conditions, and related definitely to the city's industrial outlook. Highly complimentary editorials appeared in newspaper columns hitherto occupied by critical if not distinctly unfriendly comment, and the point was made that the new schedules virtually remove the need of appeal to the state regulative body in the future.

This is not the first time that the institution of inducement rates has contributed powerfully to the establishment or maintenance of good public relations, nor will it be the last. Pains taken to make the structure and application of such rates clear to the molders of public opinion and to the rank and file of customers are worth all they cost in time and trouble.

* * * *

Bureau Specialists for Co-operative Work

A RECENT tendency in the association activities of the several groups in industry is to hire specialists at headquarters and then assign these men to represent the associations in projects that call for co-operative industry action. This organization move must be watched carefully and must not lead to bureaucratic negotiation agencies that develop their programs without any executive participation.

Expert consultants should be available to all industry group negotiators, but seldom does this type of man have the temperament or the broad perspective needed to conduct negotiations personally with other industry groups. There is a tendency for the expert to become extremely partisan, extremely narrow in viewpoint, and he quickly loses intimate contact with industry as a whole and even with his specialty. The approach to any joint industry problem must be made from an angle that gives the negotiator a view of industry good as a whole, and joint committeemen must have the spirit of compromise and a judicial temperament.

But the great objection to the expert negotiators is the tendency for executives to delegate authority to them and then wash their hands of the matter. Executive participation in negotiations and group executive contacts are essential to the accomplishment of co-operative work. Too frequently when authority is delegated a mix-up results that ultimately demands executive participation in order to clarify the situation. A job which requires settlement of policies needs executives from the start and not merely experts.

Moreover, there is no discounting the fact that the complexity and magnitude of joint work is increasing, and to build a staff at headquarters that has all the experts required for the many projects leads to a big bureau, to inefficiency in the use of the time of experts and to very large association expenses. With these industry trends so noticeable, usually it would be cheaper and better to call men from industry when they are needed for definite projects and then return them to industry when the negotiations are completed.

Many industry joint-work projects are vital to industry welfare. They are worthy of executive attention, and executive participation in joint negotiations is warranted and required. As a policy it is well to call upon executives for this work and to keep to a minimum negotiations conducted by headquarters experts or by men who are not temperamentally fitted to act with other men in a spirit of industry good. Very frequently the humorous definition of an expert is more true than false, and the industry cannot afford to take chances with vital issues because men are so labeled.

* * * *

To Promote and Defend the Intertrade Conference Agreement

ANOTHER forward step in the advancement of the trade relations of the power industry was put on the program of the N.E.L.A. Commercial Section in meetings held last week. It is a practical follow-up on the agreement reached last year in the intertrade conferences in which the national leaders of all the groups engaged in the retailing of electrical equipment to the home drew up a statement of the principles which they believe should regulate local merchandising policy in the public interest.

This agreement definitely cast the light of common understanding upon what is fair and what is unfair in local trade practice. It publicly condemned selfish and destructive methods of selling either by public utilities or by independent dealers who set up an unmeetable competition and interfere with the natural development of the market. Now it is proposed to organize these same national spokesmen for these hardware, department, drug, house-furnishing, electric and other stores as an informal council to which members of these groups may appeal and complain of local infractions of the agreement. In this way it is hoped that, by moral suasion and the arguing of individual cases, this national understanding and agreement may have the widest possible local acceptance and application.

Hardly a month goes by that some power company does not raise its voice in protest that some local merchant has thoughtlessly loosed upon the market some sub-standard appliance that is dangerous to the public. No less often does some utility break forth with a misguided sale method or other practice that throws the local trade into turmoil because it sets a sub-profit upon a staple article of merchandise, which thereafter can no longer be sold at paying prices until the local market has recovered from the debauch. In each case a sin has been committed against the broad constructive purpose of the national trade agreement, which has simply written large the ethical and economic principles on which the upbuilding of a healthy and effective market for free-flowing merchandise depends. The object is to help build a prosperous trade that will increase the volume of load-building appliances sold into the home, to everybody's benefit. It should be both promoted and defended until it has universal recognition.

Instead of indulging in local bickering and local hate, with such a council functioning, the department store may call upon its representative to ask the power industry member to reason with the offending local utility and get the tangle straightened out. Or the local power company can bring good influence to bear in the same way upon a local hardware store that isn't acting rightly. It will be another expression of the new art of inter-industry diplomacy that is bringing the world such substantial benefits today—fine fruits of patience, tolerance, tact and friendship in the interrelationships of business men.

Edison Breaks Ground for Ford Museum

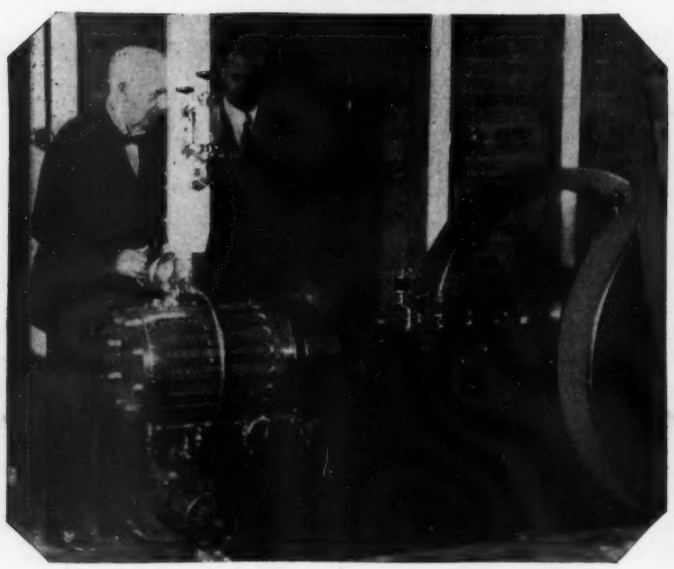
TO A large extent Thomas A. Edison will be the vital genius of the great museum of American life and progress that Henry Ford is rapidly bringing to realization at Dearborn, Mich. It was fitting, therefore that the ceremonial gesture symbolizing the start of construction of the project should have been made by Mr. Edison. Fitting also that the tool he used to break the ground for the museum was Luther Burbank's spade, the blade of which was worn thin through many years of service in the hands of that other beloved American spirit.

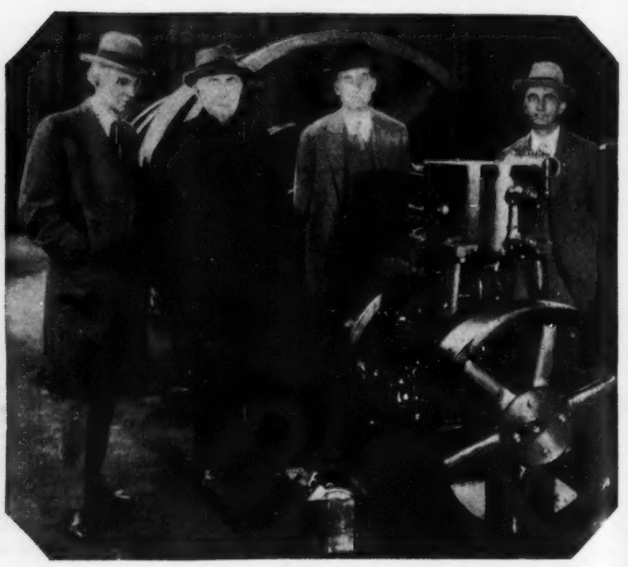
Mr. Edison sinks the spade into the ground

He puts his signature in the concrete. Mr. Ford at the left

Below, left—Mr. Edison starts the old engine that furnished power to his laboratory at Fort Myers, Fla. This laboratory was moved to Dearborn and set up exactly as it was when Edison worked in it. His first laboratory at Menlo Park and Mrs. Jordan's boarding house, across the road, where he lived, have also been moved to Dearborn and are in course of re-erection.

Below, right—Here are Henry Ford, Mr. Edison, his son, Charles, and James W. Bishop looking over some of the exhibits for the museum. Mr. Bishop, who worked with Mr. Ford in old "Station A" of the now Detroit Edison Company and is now superintendent of substations of that company, is in general charge of the collection of electrical exhibits.



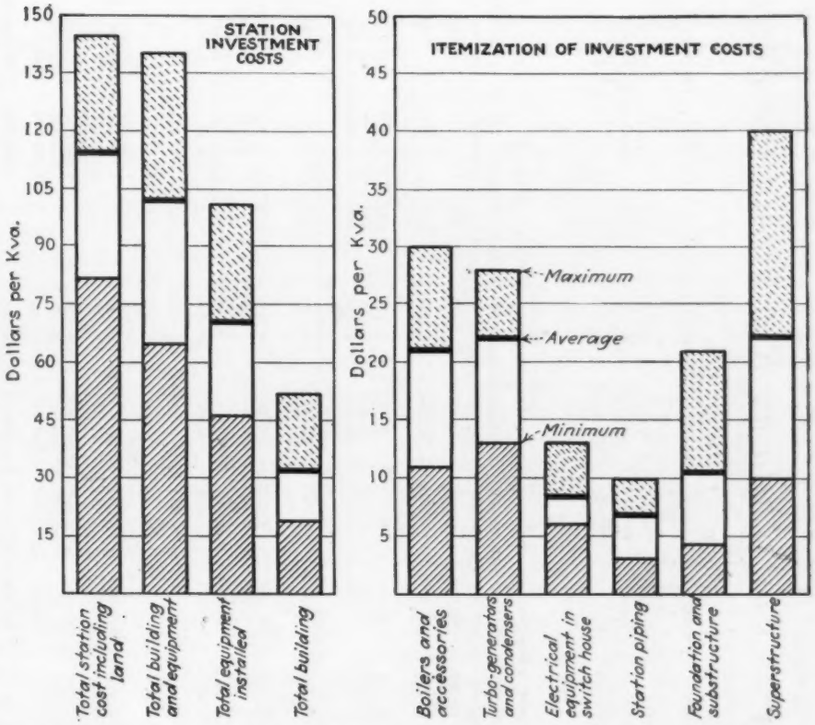


Power Costs in Large Plants

Representative utility power station investment and operating costs analyzed. Opinion has governed design too greatly. Possible saving of $120,000,000 a year in station installation

By L. W. W. Morrow
Managing Editor Electrical World

FACTS instead of opinions should prevail in power station design. The difference between $140 and $80 per kilovolt-ampere as the cost of similar stations cannot be explained wholly because of differences in local conditions, load factor or fuel cost. Nor do generating costs ranging from 0.65 cent per kilowatt-hour to 1.2 cents per kilowatt-hour at the busbars differ so greatly because of fuel prices or load factors. When some stations use four times the number of employees that another does per unit of capacity there is room for economic justification of this difference in labor charges, especially when thermal efficiencies are about the same and operating conditions are similar. Large differences in these items are to be expected, but very wide ranges lead to questions.



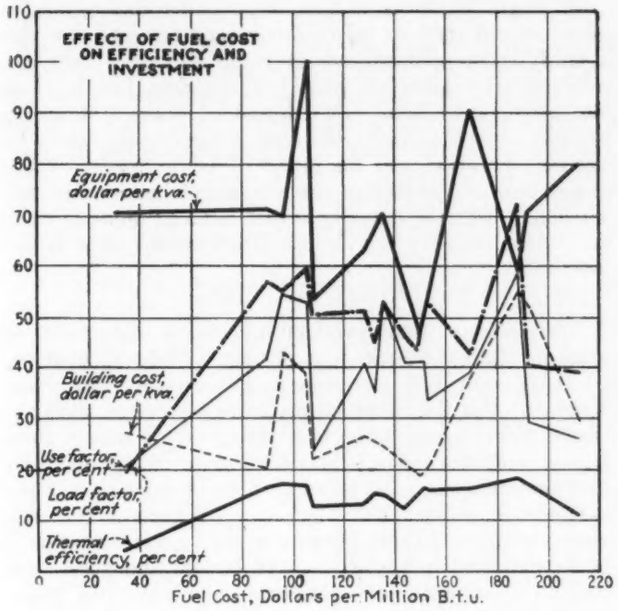
A pioneering group of engineers have built several new power stations since the war. They have improved the economic and thermal performance of plants very materially and the trends they started bid fair to bring about still greater economies. But some mistakes were made and it is advisable to study the investment costs and the operating costs of these plants in order to build better and more economical stations in the future. For this reason the Electrical World has collected data on a representative group of modern steam stations. These plants are located in several parts of the country, operate under different conditions and embody different design ideas. Data on these plants are not comparable, but the range of values and unit values on items unaffected by local station conditions afford yardsticks for measurement and give valuable guides and checks for future station designs. With a yearly increment of 2,000,000 kva. in station capacity added to utility systems there is involved a plus or minus sum of about $120,000,000 per year that can be lost or saved depending upon station design specifications. The data given in Table II show station costs ranging from $81 to $140 per kilovolt-ampere. This is less than a two to one range in costs, and the costs of equipment in these stations, which should be somewhat comparable, range from $46 to $101 per kilovolt-ampere. This wide range in equipment cost cannot be explained entirely by differences in local conditions. Real estate, buildings, foundations, etc., are eliminated and the equipment is of a similar type as regards steam conditions and has very nearly the same rating. Nor can the current argument that high equipment cost has been justified to get high thermal efficiency in stations with high load factors and expensive fuel be accepted on the data shown. These stations were all built since 1924 and represent average rather than extremes in station design.

Investment Costs and Values

Local investment cost variables are real estate, site preparation, foundation, labor and, in large measure, the switch house. But in general, aside from labor costs, it is valid to make comparisons of the cost of the equipment installed in a station and the cost of the station building. These two items are the major cost items in most stations. Table II shows the range of values and the average values of investment costs for the completed stations and the divisions of the station as summarized from Table I.

Table I—Summary of Cost Data on Representative Power Stations

Station	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Approximate rating, kva	100,000+	50,000—	100,000—	100 000—	100,000+	100,000+	100,000—	250,000+	200,000+	300,000+	100,000+	50,000—	50,000—	100,000—	50,000+	100,000—
Number of generators	3	1	2	2	2	3	2	4	5	5	2	1	2	2	2	3
Number of boilers	15	6	9	8	12	6	8	16	19	11	8	2	6	6	4	8
Type of service	Transmission	Distribution	Distribution	Transmission	Distribution	Transmission	Transmission	Distribution	Distribution	Transmission	Transmission	Transmission	Transmission	Transmission	Transmission	Transmission
Fuel used	Oil and gas	Oil and gas	Coal	Coal	Coal	Coal	Coal	Coal	Coal	Coal	Coal	Coal	Coal	Coal	Coal	Coal
Fuel equipment	.....	.....	Pulver.	Stokers	Stokers	Pulver.	Stokers	Stokers	Pulver.	Pulver.	Pulver.	Pulver.	Stoker-pulv.	Pulver.	Pulver.	Stokers
Steam pressure	375	375	400	600	400	350	600	325	300	375	600	400	300	350	350	300
Steam temperature	725	700	700	725	680	675	725	690	700	690	720	700	600	690	650	700
Operating Data																
Period covered	One year	One year	Six months 1 unit	One year	One year	One year	One year	One year	One year	One year	One year	One year	One year	One year	One year	One year
Total kilowatt-hours generated	250,000,000	175,000,000	80,000,000	416,000,000	717,000,000	454,000,000	298,000,000	715,000,000	653,000,000	929,000,000	481,000,000	120,000,000	158,000,000	286,000,000	116,000,000	191,000,000
Net kilowatt-hours generated	242,000,000	168,000,000	75,000,000	393,000,000	686,000,000	425,000,000	279,000,000	678,000,000	618,000,000	841,000,000	452,000,000	114,000,000	153,000,000	267,000,000	110,000,000	182,000,000
Average b.t.u. in fuel	Gas 1,100 Oil 19,000	Gas 1,100 Oil 18,900	13,800	11,300	13,800	12,300	10,600	13,300	11,300	13,100	13,800	7,600	11,300	13,700	9,750	13,700
Number of men engaged (all shifts)	160	66	70	184	142	139	162	352	225	245	48	76	27	63	69	98
Operating Costs (Cents per Kw.-Hr.)																
Fuel	0.205	0.224	0.241	0.156	0.258	0.142	0.271	0.325	0.224	0.229	0.143	0.24	0.299	0.251	0.214	0.418
Wages and supplies	0.115	0.077	0.076	0.056	0.031	0.039	0.076	0.086	0.041	0.044	0.041	0.09	0.069	0.060	0.112	0.062
Water, lubricants, supplies	0.010	.....	0.005	0.011	0.003	0.007	0.016	0.012	0.005	0.014	0.007	.....	0.003	Incl. above	0.015	0.006
Miscellaneous	0.002	0.041	0.007	0.001	.....	.....	0.003	.....	0.037	.....	.....	.....	0.008	Incl. above	.....	0.003
Total (Cents per Kw.-Hr.)	0.332	0.342	0.329	0.224	0.292	0.188	0.366	0.423	0.307	0.287	0.191	0.33	0.379	0.311	0.341	0.4899
Maintenance Costs (Cents per Kw.-Hr.)																
Buildings	0.003	0.005	0.009	0.008	0.004	0.007	0.005	0.008	0.0032	0.005	0.001	.....	0.006	0.005	0.005	0.006
Boiler plant	0.023	0.026	0.025	0.033	0.009	0.025	0.041	0.027	0.0241	0.023	0.012	0.02	0.028	0.016	0.006	0.02
Prime movers and auxiliaries	0.022	0.009	0.002	0.006	0.002	0.004	0.006	0.009	0.0060	0.001	0.004	.....	0.001	0.003	0.002	0.02
General and electric equipment	Incl. above	Incl. above	0.001	0.002	0.001	0.008	0.001	0.010	0.0032	Incl. above	0.003	.....	0.001	0.001	0.005	0.008
Miscellaneous	0.001	.....	0.001	0.002	0.002	0.000	0.003	0.001	.....	0.003	0.005	.....	0.002	0.001	0.0165	0.006
Total (Cents per Kw.-Hr.)	0.049	0.040	0.038	0.051	0.018	0.034	0.056	0.055	0.0365	0.032	0.025	0.02	0.038	0.026	0.0345	0.060
Investment Costs (Dollars)																
Preparing site	75,000	65,000	.....	.....	.....	230,000	.....	4,000,000	.....	1,100,000	80,000	250,000	.....	15,000	40,000	30,000
Foundations, substructure	1,700,000	125,000	.....	1,300,000	900,000	1,700,000	1,400,000	Incl. above	.....	1,200,000	2,100,000	Incl. above	.....	550,000	200,000	800,000
Superstructure	2,200,000	1,000 000	.....	2,000,000	1,300,000	1,100,000	2,000,000	10,300,000	.....	5,300,000	2,200,000	600,000	.....	900,000	90,000	1,700,000
Fuel handling and preparation	200,000	80,000	.....	1,700,000	200,000	700,000	1,100,000	Incl. above	.....	1,200,000	700,000	400,000	.....	400,000	230,000	500,000
Boilers and accessories	3,500,000	900,000	.....	2,400,000	2,100,000	2,500,000	2,600,000	20,000,000	.....	4,800,000	2,100,000	600,000	.....	800,000	450,000	2,000,000
Piping	1,100,000	200,000	.....	500,000	1,400,000	400,000	500,000	Incl. above	.....	2,700,000	700,000	300,000	.....	400,000	200,000	800,000
Generators and condensers	3,200,000	1,200,000	.....	2,100,000	1,700,000	2,700,000	2,000 000	Incl. above	.....	5,200,000	2,000,000	800,000	.....	1,600,000	1,100,000	2,100,000
Electric equipment in switch-house	1,300,000	250,000	.....	Incl. above	1,800,000	1,200,000	Incl. above	Incl. above	.....	1,000,000	1,200,000	Incl. above	.....	300,000	200,000	500,000
General Data																
Million b.t.u. used	14,200	2,700	1,180	5,820	9,500	6,700	4,200	11,560	10,320	13,200	6,500	2,100	3,170	4,450	2,170	3,600
Fuel cost per million b.t.u. (dollars)	35	136	154	142	186	90.50	171	191	134	154	96	127	.....	151	108	212
Load factor	18	53	51	.....	72	56	43	40	46	53	55	51	47	44	50	40
Use factor	20	53	41	.....	58	43	39	30	36	34	54	48	41	44	24	26
B.t.u. per net kilowatt-hour	58,700	16,400	15,600	14,780	13,820	15,750	15,180	17,000	16,700	15,700	14,400	19,100	20,700	16,600	19,900	19,850
B.t.u. per gross kilowatt-hour	55,600	15,800	14,900	14,000	13,200	14,750	14,200	16,150	15,800	14,200	13,500	18,000	20,000	15,500	18,800	18,800
Thermal efficiency (net basis)	4.4	15.5	16.3	17.25	18.45	16.2	16.8	14.9	15.2	16.22	17.7	13.3	12.25	15.3	12.8	12.85
Unit Costs																
Total station cost, dollars per kva	100	128	85	142	144	132	130	127	121	81	115	106.50	.....	81	110	112
Building cost, dollars per kva	27	25	.....	39	56	21	38	52	.....	21	43	26	.....	19	22	30
Equipment cost, dollars per kva	71	71	.....	101	59	71	90	71	.....	55	70	63	.....	46	53	80
Total fixed charge (15 per cent basis) (cents per kw.-hr.)	0.89	0.366	0.146	0.476	0.442	0.424	0.592	0.436	0.613	0.431	0.458	0.576	.....	0.341	0.52	0.768
Total production charges (cents per kw.-hr.)	0.38	0.382	0.366	0.275	0.310	0.227	0.421	0.478	0.343	0.319	0.216	0.35	0.417	0.337	0.37	0.546
Total cost per kw.-hr. (cents)	1.27	0.748	0.512	0.751	0.752	0.651	1.013	0.914	0.956	0.750	0.674	0.926	.....	0.678	0.89	1.314
Cubic Feet per Kilovolt-Ampere																
Coal preparation and handling	.....	.....	5	.....	2.2	7	.....	.....	5	6	6	10	.....	5.5	4	.....
Boiler room	30	30	14	31	50	23	31	31	21	20	33	21	15	20	20	16
Turbine room	14	10	11	19	35	17	18	17	11	4.5	15	23	8	17	17	15
Switch house	7.5	27	3	1.25	14	6	1.25	14	6	.....	6	.....	4	6	6	6
Men per 1,000 kva. per day	1.6	1.4	0.7	1.8	1.4	1.4	1.6	1.4	1.1	0.81	0.5	1.5	0.6	0.6	1.4	1.0


EFFECT OF FUEL COST ON EFFICIENCY AND INVESTMENT
Equipment cost, dollar per kva.
Building cost, dollar per kva.
Use factor, per cent
Load factor, per cent
Thermal efficiency, per cent
Fuel Cost, Dollars per Million B.t.u.

It happens that the highest total station cost applies to the plant that has the highest load factor and fuel cost, but the cost of equipment in this station is about the average per unit and its thermal efficiency is only average. In the group of stations that operate with load factors between 38 and 60 and with fuel costs between $90 and $170 per million B.t.u. it will be noted that there is little justification for saying that station investment has been based on thermal efficiency, load factor or cost of fuel. The range of cost is too great to be explained except by the application of different ideas to station designs.

In Table II some very interesting data are summarized. The total cost of completed stations, including all items of land, preparing site, overhead, etc., ranges from $144 maximum to $81 dollars minimum per kilovolt-ampere. The total building cost, including both substructure and superstructure, ranges from $52 to $19. Breaking this total building cost into two parts, i.e., superstructure, and foundation and substructure, it will be noticed that there is a 5.2 to one range in the cost of substructure and a four to one range in the cost of superstructure, both ranges greatly in excess of the range found in total building costs. Of this group of costs, aside from labor charges, those of the superstructure should be comparable, yet there is a four to one range in unit costs. This difference gives rise to speculation as to reasons for the differences and a study of unit station volumes in Table III gives an indication of one important variable that may be responsible for the cost range.

The total equipment cost shown in Table II includes

TABLE II—UNIT INVESTMENT COSTS IN DOLLARS PER KILOVOLT-AMPERE

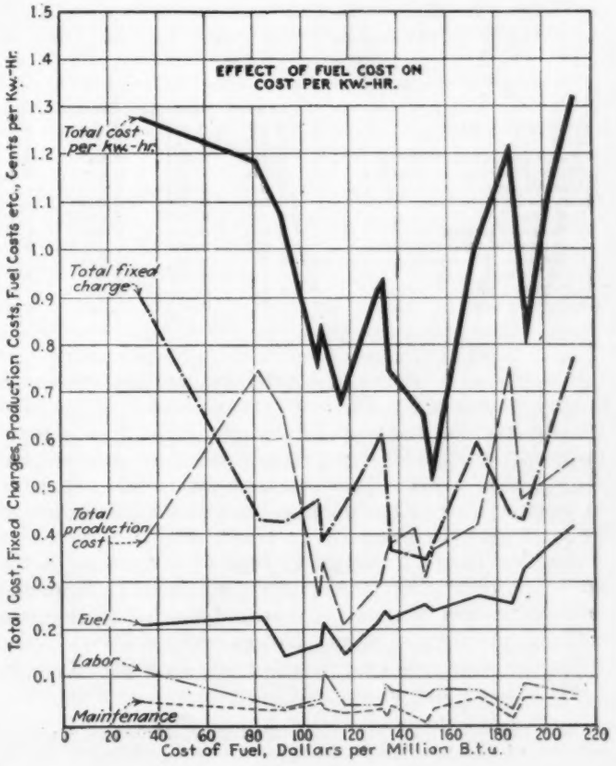
	Maximum	Minimum	Average	Range
Total station cost, including land	144	81	114	1.7:1
Total building and equipment	140	65	102	2.3:1
Total building cost	52	19	32	2.7:1
Foundations and substructure cost	21	4	10.6	5.2:1
Superstructure cost	40	10	22.0	4:1
Total equipment cost	101	46	70	2.2:1
Boilers and accessories	30	11	21	2.7:1
Station piping	10	3	7	3.3:1
Turbo-generators and condensers	28	13	22	2.1:1
Electrical equipment in switch house	13	6	8.5	2.1:1

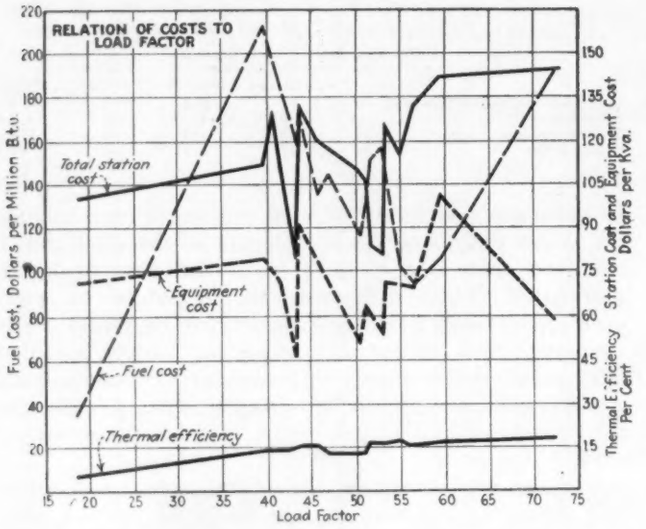
TABLE III—UNIT VOLUMES IN POWER STATION
(Cubic Feet per Kilovolt-Ampere)

	Maximum	Minimum	Average	Range
Coal preparation and handling	10	2.2	6	4.5:1
Boiler room	50	14	21	3.5:1
Turbine room	35	4.5	15	7.8:1
Switch house	27	0.6	6	45:1

all apparatus and the subdivided equipment costs include the larger groups only. Here again in the total and in the items there is a range of more than two to one in unit costs. These differences should not be so large, even though local modifying factors can be found. The equipment in a station has one primary object, and that is to get a reliable supply of energy at a minimum total cost to the station and to the utility system. Weighed in this balance a two to one range in unit cost values is entirely too great.

For the average station $12 is the cost of real estate and preparing the site, but the range of costs is very wide. Local variables influence foundations and substructure costs, yet a study of Table II shows a range for turbo-generators, boilers and accessories and station piping that is about as wide as that for those elements affected so largely by local conditions. These costs are completely installed costs with all overhead applied, and it will be noted that an average building cost of $32 and equipment cost of $70 add to give a total station cost of $102 that does not include cost of real estate or cost of preparing the site. Yet on a minimum basis these costs would be $19, $46 and $65 respectively, although no single station of Table I meets this minimum cost specification. The average cost values and the wide range in values lead to some interesting speculations as to possibilities for building a station to meet the low cost values. Assuming minimums and $12 for real estate and site preparation a unit completed plant cost of $77 is a goal not yet reached, but which apparently is possible


EFFECT OF FUEL COST ON COST PER KW.-HR.
Total cost per kw.-hr.
Total fixed charge
Total production cost
Fuel
Labor
Maintenance
Total Cost, Fixed Charges, Production Costs, Fuel Costs etc., Cents per Kw.-Hr.
Cost of Fuel, Dollars per Million B.t.u.



under special conditions. Total station costs of actual stations of $85 and $81 show that this minimum value has been approached very satisfactorily in two plants. The economic size of station from an investment cost point of view cannot be determined from the data, but in general the larger station has the greatest possibilities for cost reduction except where the station becomes very large. Then piping, control, fuel movement and other space factors become large and introduce increment cost increases per unit of capacity.

Space Factors Affect Investment

Unit volume values in Table III help to interpret the investment cost values given in Table II. A large range is to be expected in coal preparation and handling and in the switch house because the plants burn coal, oil, gas and use stokers or pulverizers and serve both distribution and transmission systems. But all have about the same rated boilers and turbines, and yet the range of unit volume for the boiler room is 3.5 to one and for the turbine room is 7.8 to one. Space is a great operating asset, but these ranges seem to indicate that some plants are too spacious and others too restricted in volume; at least the range is too great to be supported by intelligent designers.

TABLE IV—UNIT PRODUCTION COSTS IN CENTS PER KILOWATT-HOUR

	Maximum	Minimum	Average	Rang
Operating cost, total	0.489	0.189	0.322	2.6:1
Fuel	0.418	0.142	0.240	2.9:1
Wages and superintendence	0.115	0.031	0.067	3.7:1
Water, lubricate and supplies	0.016	0.003	0.009	5.3:1
Miscellaneous	0.041	0.001	0.012	4.1:1
Maintenance cost, total	0.056	0.018	0.038	3.1:1
Buildings	0.009	0.0007	0.0052	1.3:1
Boilers and accessories	0.041	0.006	0.022	6.8:1
Prime movers and accessories	0.022	0.001	0.0062	2.2:1
Generators and electrical equipment	0.01	0.001	0.0034	10:1
Production cost, total	0.545	0.207	0.36	2.7:1
Fixed charge, total	0.895	0.146	0.50	6:1
Total cost of power	1.44	0.353	0.86	4:1

Another item of interest as regards investment is the use of automatic equipment to reduce labor charges and improve station economy. Increased fixed charges might well be justified if other charges were reduced. The following data give the number of men per day per 1,000 kva. of station capacity:

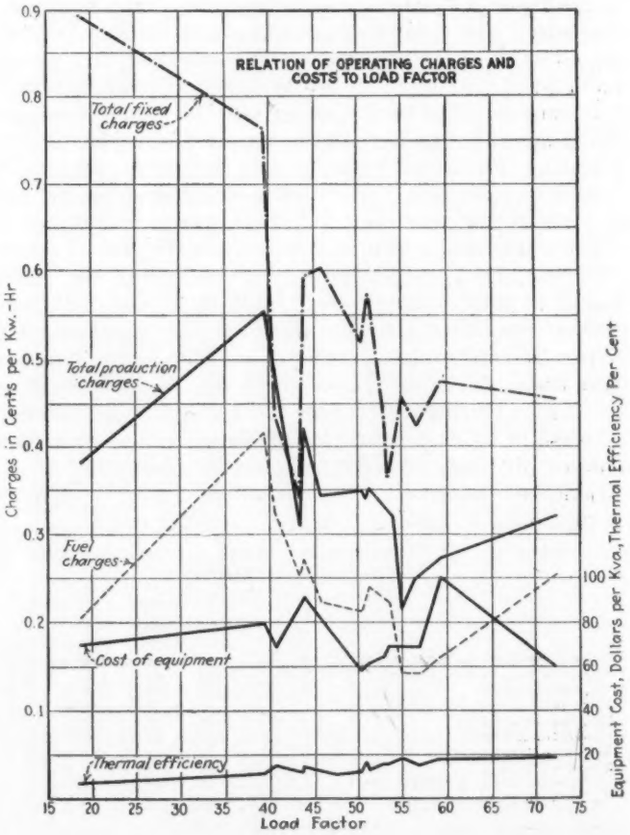
	Maximum	Minimum	Average
Number of men	1.8	0.5	1.2

It might be thought that large boiler and generator units would tend to lower labor requirements and that a study of thermal efficiencies would also show their correlation with labor charges, but the data fail to bring out any conclusions. The design of some stations introduces many complexities that require extra labor for station operation and the effect of labor prices, of fuel prices and of the skill of the available labor modify conclusions. But the data show that reduced labor per unit of station capacity is a design desideratum and a design possibility.

Production Costs

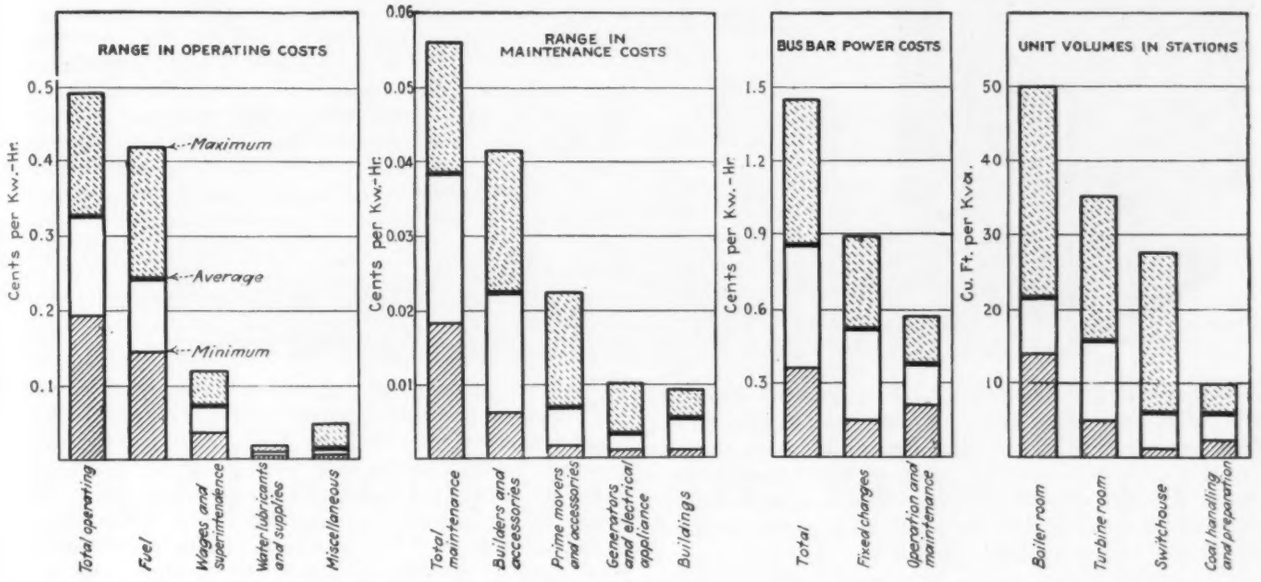
The average total production cost in the group of stations studied is 0.36 cent per kilowatt-hour, made up of 0.322 cent for operation and 0.038 cent for maintenance. But the range of production costs as shown in Table IV is from 0.545 to 0.207 cent, or nearly three to one, and this range is about the same in the operation and maintenance subdivisions of the total cost. These ranges are remarkable when compared to a fuel cost range of three to one because a very great variation is to be expected in fuel costs. In boilers and accessories and in generators and electrical equipment the maintenance range is seven to one and ten to one respectively and a wide range is to be expected, but, comparatively, it is worthy of note that the variation in maintenance of electrical equipment is greater than that of the boilers, although the magnitude of the cost is about eight times less. In fact, the boiler maintenance averages twice as much as the sum of all other maintenance charges.

The total operating cost averages 0.322 cent, of which 0.24 is a fuel charge. Fuel cost is about three times that of all other operating charges. A nearly four to one range exists in the cost of wages and superintendence and a five to one range in the cost of water, lubricants and supplies. The wide range of these costs


RELATION OF OPERATING CHARGES AND COSTS TO LOAD FACTOR
Total fixed charges
Total production charges
Fuel charges
Cost of equipment
Thermal efficiency
Charges in Cents per Kw.-Hr
Equipment Cost, Dollars per Kva., Thermal Efficiency Per Cent
Load Factor

is rather remarkable when compared with the range in fuel costs.

Using a minimum of operating and maintenance charges, it will be seen that the goal to shoot at is 0.207 cent per kilowatt-hour and that the minimum total generating cost is 0.353. This figure was not approached closely by any station, nor was the sum of the maximum values. On an average basis the total cost of power at the generating station busbars is 0.86 cent. This value may well be taken as about the minimum in American practice, since these stations are a group of the best plants to be found in operation. Of this total cost of 0.86, the fixed charges amount to 0.5 cent and the total production charges 0.36 cent, approximately a 60-40 division.



Conclusions

From the investment and operating charges shown by representative new stations it would seem to be advisable to study these stations carefully from a cost point of view before building new power stations. Apparently there is an opportunity to save or to lose more than $120,000,000 a year, depending upon how well the industry capitalizes upon the power station data available.

As was to be expected in pioneering work, the variety of station designs resulted in wide ranges in fixed and operating charges, yet thermal efficiency ranges were small. Some efforts to get high efficiency at the expense of larger investment charges failed to produce results, but in other cases appreciable gains were made.

Opinion in station design should not lead to new stations that have a high first cost or a high operating cost. As a general principle it is apparent that economic factors should dominate station design. Some plants have an excessive equipment cost and a high labor cost, yet produce poorer over-all economic operating results than cheaper and simpler stations. No positive conclusions can be made that cost of fuel or load factor have been determining elements in the total cost of operation or the efficiency of the group of stations surveyed.

Station generating costs afford little measure of the system cost of energy. The heavy investment and operating charges involved in transmission, substations and distribution systems are several times those involved in generation. But the large sum spent to improve service and voltage regulation at consumers' premises in recent years are partly offset by the reduction in station generating charges made possible by engineering developments. Power station engineers have made greatest reductions in costs of any group in the industry during the past ten years and to them belongs a great deal of credit for the stable earnings position of the utilities.

The costs recorded in this article should be considered as very complimentary to American power station designers. The range in costs is understandable when different states of ultimate completion of plants, differences in operating and load conditions, differences in fuel and radical departures in design are all taken into account. Direct comparisons of these costs are not intended except as yardsticks to make new stations better and cheaper. The author wishes to acknowledge the constructive attitude of utilities in making it possible to record and analyze the data given in this article.

Importance of Care in Installing Large Units

EVERY central station that builds a power plant is naturally anxious to get it on the line at the earliest possible moment because each hour's delay costs money. So meticulous was the care used in installing a 56,000-hp. waterwheel and its 45,000-kva. generator at the Big Creek No. 2-A plant of the Southern California Edison Company and so carefully were mechanical parts designed and assembled that it was possible to put the unit on the line in regular service carrying full load in 15¾ hours after water was first turned into the waterwheels. In this period of time all mechanical and electrical adjustments had been made and the machine was ready for normal duty.

By a precision method of shaft leveling no bearing adjustment or scraping was necessary; the generator was thoroughly dried out and tested in advance and the whole job was a tribute to large manufacturing companies and their erectors, whose wide experience in installing large machinery makes possible a record of this kind.

Standard Telephone Booth for Outdoor Substations

AT EACH outdoor substation of the Ohio Public Service Company in Mansfield a permanent telephone booth has been installed and a lead from the company's private telephone system brought in underground. These booths are also used for storing spare fuses, instruments and records, and permanent recording voltmeters on station bus voltage are located here. The booths are constructed of wood covered on the outside with galvanized sheeting and painted the same color as other station apparatus. They are identical in size and dimensions with the oil circuit breaker houses and are equipped with glass-paneled doors. Besides providing shelter for the telephone and instruments the design of the booth adds to the uniform appearance of the outdoor substations.

Metal-Clad Draw-Out Switchgear Effects Economies

By P. R. Pierson
Switchboard Engineering Department,
Westinghouse Electric & Manufacturing Company

IN THE fall of 1925 the management of the Homestead works of the Carnegie Steel Company was looking forward to the early operation of the new, completely electrified mill. Due to unavoidable conditions, the completion of the mill machinery installation was accomplished before the switch gallery was finished. With such a large investment, a delay in starting to roll steel after the mill is completed is expensive. In this case the work of the electrical department was greatly simplified by having metal-clad draw-out type switchgear available. The necessary housings were set up on the motor room floor and temporary cables were run connecting the supply, the bus in the switchboard and mill motors. Operation was carried on with complete satisfaction, protection to equipment and safety to operator. Several weeks later, when the switch gallery was ready, the temporary switching was knocked down and moved to its permanent location during a Sunday shutdown.

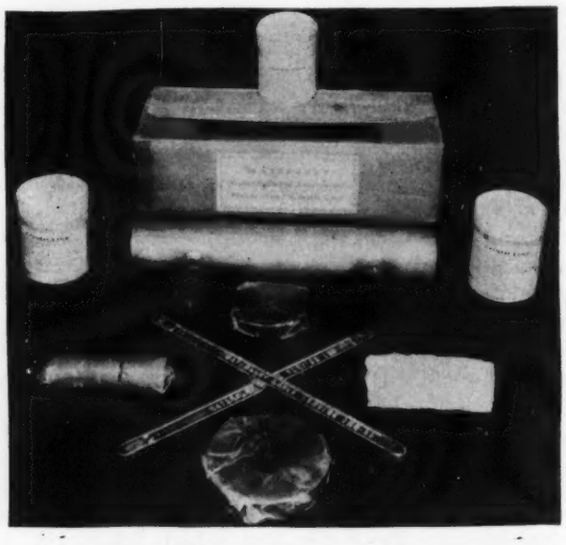
The Commonwealth Edison Company of Chicago anticipated using the flexibility of metal-clad draw-out type switchgear when it purchased that type of equipment for controlling the auxiliaries of the No. 3 unit at Crawford Avenue. Advance delivery of several of the units was required in order to operate the blowers necessary to dry out the furnaces under the new boilers. The temporary set-up permitted work to progress in both the switching gallery and the boiler room, while the temporary equipment operated with complete protection and safety. After power was available from the permanent sources to run the blowers and pumps the switchgear equipment was moved to its permanent location.

The electrification of an old mill involves considerable planning and offers some intricate problems. At the Farrell Works of the Carnegie Steel Company the problem was the most efficient use of space when planning the control of the 4,000-hp. synchronous type mill motor. The solution of the problem was metal-clad draw-out type switchgear. The entire control for the motor was incorporated within the switching structure, thus obtaining the greatest space economy available from this type of equipment. The time required for the installation and starting of this apparatus was materially reduced by the fact that all control wiring was complete and was terminated in plainly marked, accessible terminal boards. This complete assembly permitted a sequence test of breakers and control at the factory, thus assuring correct operation in the minimum of time when installed.

Unit Packages Avoid Waste of Cable Splicing Material

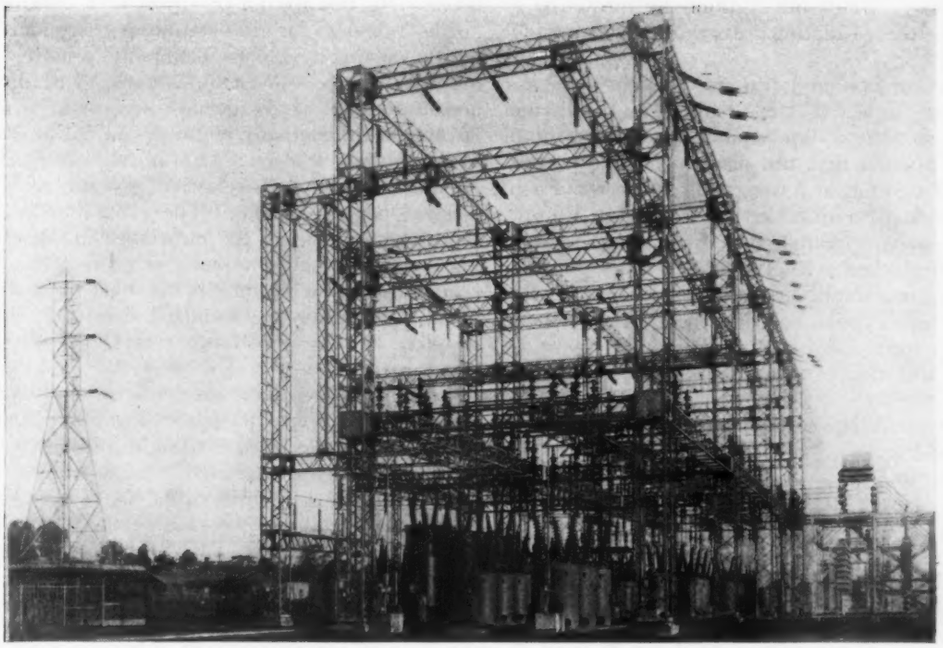
THE purchase of splicing material assembled in unit packages has been proved by the United Electric Light & Power Company, New York, to be both practical and economical. In the field waste and theft are eliminated by having the necessary material delivered to the splicer in the quantity required for one or three joints, as the case may be. The purchase, storing and ordering from stock are greatly simplified. In the storeroom, less space is required for a given stock and stock on hand can be more easily checked and sudden shortages of necessary items are less likely to occur.

The lead sleeves included in these packages are fitted



This unit package contains all the necessary material for making a splice

with an improved tapered nipple, plug and cap, which insure a water- and air-tight seal. These nipples facilitate the testing of the joints by vacuum or pressure after their completion. These unit packages of material for any size or type of joint are purchased from the Waterbury Cable Service, Inc., New York.



A Modern Tie-in Substation

New unit in Consumers Power Company system serves large area and is tie-in point for Detroit Edison interconnection. Simplicity a feature of switching arrangement. Special relay applications

By W. W. TEFFT
Vice-President and Chief Engineer
Commonwealth Power Corporation of Michigan, Jackson, Mich.

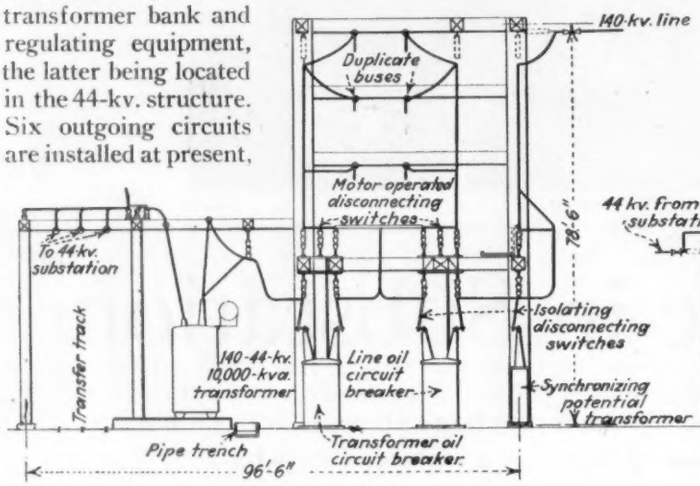
THE Blackstone substation of the Consumers Power Company at Jackson, Mich., is the connecting link between the company's main 140-kv. transmission system and the Jackson distribution territory. It also serves as the western terminal point for the recently completed 30,000-kva. interconnection with the Detroit Edison Company. The substation is divided into two major parts, the 140-kv. and the 44-kv. structures, each of which has an ultimate provision for at least ten lines, with the control and repair house in between them. The high-voltage structure includes a full double bus with one oil circuit breaker and transfer disconnects for each circuit, together with a bus tie breaker and lightning arrester protection on each bus. This switching arrangement allows the operator to split the system into two electrically isolated units for test or other purposes and the tie breaker can also be used to protect any individual circuit. In general, this type of high-voltage switching structure is quite typical of current practice on the Consumers Power Company's system and associated properties and it seems to solve satisfactorily the usual problem of obtaining desirable operating characteristics within a minimum amount of ground area and without running into an extremely complicated and expensive structure.

The Detroit interconnection is brought in to the 140-kv. bus through line and bus oil circuit breakers and a 30,000-kva., 140-140-kv. transformer bank provided with load ratio control equipment. The three 10,000-kva., 140-140-kv. transformers in the Detroit Edison line were supplied by the Westinghouse Electric & Manufacturing Company and the load ratio control equipment, which has a range of 25 kv. raise or lower, is built in as an integral part of each transformer. The three 10,000-kva., 140–44 Allis-Chalmers transformers are supplemented on the low-tension side with a separate 30,000-kva. Westinghouse regulating transformer with a range of 12½ per cent raise or lower. All 140-kv. oil circuit breakers are Westinghouse type G-22, 600 amp., 154 kv. The isolating disconnecting switches, of the underhung post type, were supplied by the Electrical Engineers Equipment Company and are manually operated. The motor-operated bus transfer switches are of Railway & Industrial Engineering Company manufacture and are of the double-break rotating insulator type. The high-voltage metering equipment on the Detroit Edison tie includes individual 155-kv. current transformers (at the time of installation the highest rating built) and 120:1 potential transformers, all General Electric. These transformers are arranged so that they can be cut out

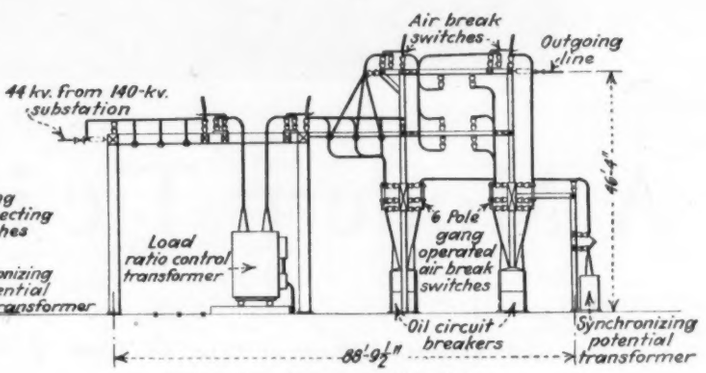
of service without a circuit interruption by means of a modification of the isolating disconnecting switch principle.

The 140-kv. motor-operated transfer switches are interlocked with the respective line breakers and with the bus tie breaker so that a line cannot be thrown onto a dead bus and also so that the disconnecting switches will not be called upon at any time to break load. Each line is also provided with an Electrical Engineers Equipment Company gang-operated line grounding switch, which is also interlocked with the line breaker so that both cannot be closed simultaneously. Each line is also provided with a series choke coil, but the Detroit Edison line is the only one having an individual lightning arrester. This and the two bus arresters are of the oxide film type.

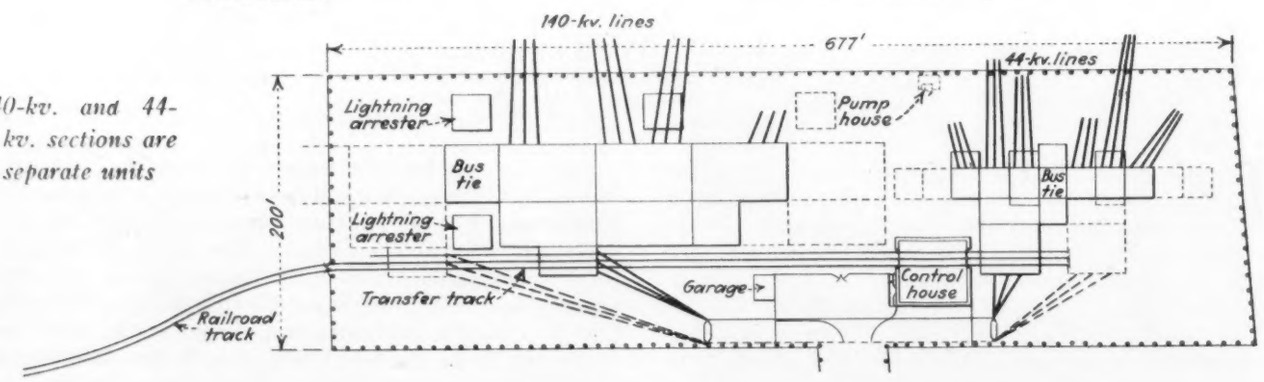
The 44-kv. structure has a main and transfer bus fed from the 30,000-kva. transformer bank and regulating equipment, the latter being located in the 44-kv. structure. Six outgoing circuits are installed at present,



Typical Transformer and Line Bay
140-Kv. Section



Typical Transformer and Line Bay
44-Kv. Section



140-kv. and 44-kv. sections are separate units

two supplying the local distribution substations and the four others radiate in as many directions. The main bus is split in the center by two sets of gang-operated disconnecting switches, with a bus tie breaker for feeding the transfer bus connected to their common terminals. It is thus possible at certain times to interrupt one-half of the main 44-kv. bus for maintenance purposes after transferring the loads normally fed therefrom to the transfer bus. Each feeder can be connected to the transfer bus by means of a 50-kv. air-break switch, which is also provided with a line grounding device. The 44-kv. breakers, which are Westinghouse type G-222, rated 600 amp., 73 kv., can be isolated by means of six-pole, gang-operated disconnect switches. As on the 140-kv. structure, each bus is protected by an oxide film lightning arrester and the outgoing lines are provided with choke coils, but are not equipped with lightning arresters.

The relaying for this station is in general conformity with Consumers Power Company practice and on the majority of the 140-kv. lines consists of directional impedance relays and special directional ground relays, developed by company engineers in conjunction with the Westinghouse Electric & Manufacturing Company for obtaining rapid and selective ground relaying on this isolated neutral system. The ground relays depend for their operation upon the unbalance in the system charging currents when one phase is grounded. Short circuit relaying on these circuits is obtained by the ordinary impedance relays, while standard overload relays are used in place of the impedance relays on the short line to Trail Street.

For the 44-kv. lines power directional overload relays are used on all circuits possessing other sources of supply, while on the straight feeders ordinary overload relays are used. Each transformer bank is protected by differential relays backed up by overload relays in the case of the 44-kv. bank and by directional impedance and ground relays on the interconnection bank. Bushing type current transformers and bus potential transformers are used for all relaying at both voltages. Synchronizing potential transformers are also installed on the four longer 44-kv. lines.

The combination control and repair house is a brick and concrete building approximately 50 ft. square and 55 ft. high, the east half of which, for its full height, is used for a transformer repair house. The transfer track from both the 140- and 44-kv. structures runs through this portion of the building and a 60-ton crane is provided for handling the equipment. The track is also extended to the north to connect with the adjacent railroads, thus allowing incoming equipment to be unloaded by crane when desired.

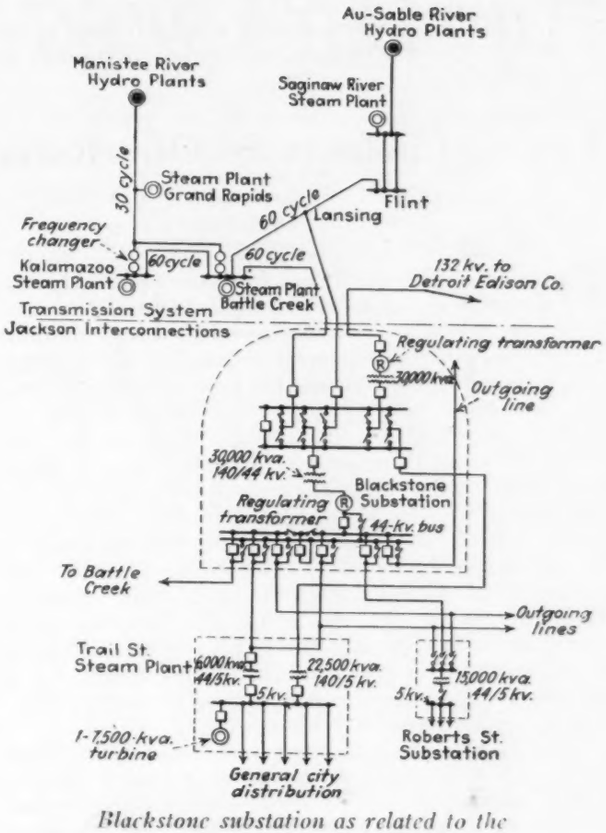
On the ground floor on the western half of the build-

ing is an entrance lobby, a terminal and battery room and a furnace room and on the second floor is the main station switchboard, from which is controlled all of the switching equipment in the station, with the exception of the disconnecting and transfer switches in the 44-kv. structure. Indicating lights, however, are provided for the latter switches so that the operator has full information as to the source of supply for all circuits. Besides the control and indicating instruments, this switchboard also contains all relaying equipment, together with the metering facilities for the interconnection. The four main buses in this station are designated by colors rather than numbers or letters, the two 140-kv. buses being labeled "White" and "Blue" and the 44-kv. "Red" and "Orange," and mimic buses colored to correspond are provided on the switchboard. The third floor of the building contains the station power transformers and switching equipment, together with telephone apparatus and other miscellaneous material. The station power supply is obtained from two local 5,000-volt distribution circuits, the taps being brought in through two Condit type D-12, 400-amp., 15-kv. oil circuit breakers, which supply three 25-kva. transformers for three-phase power and one 50-kva. lighting transformer.

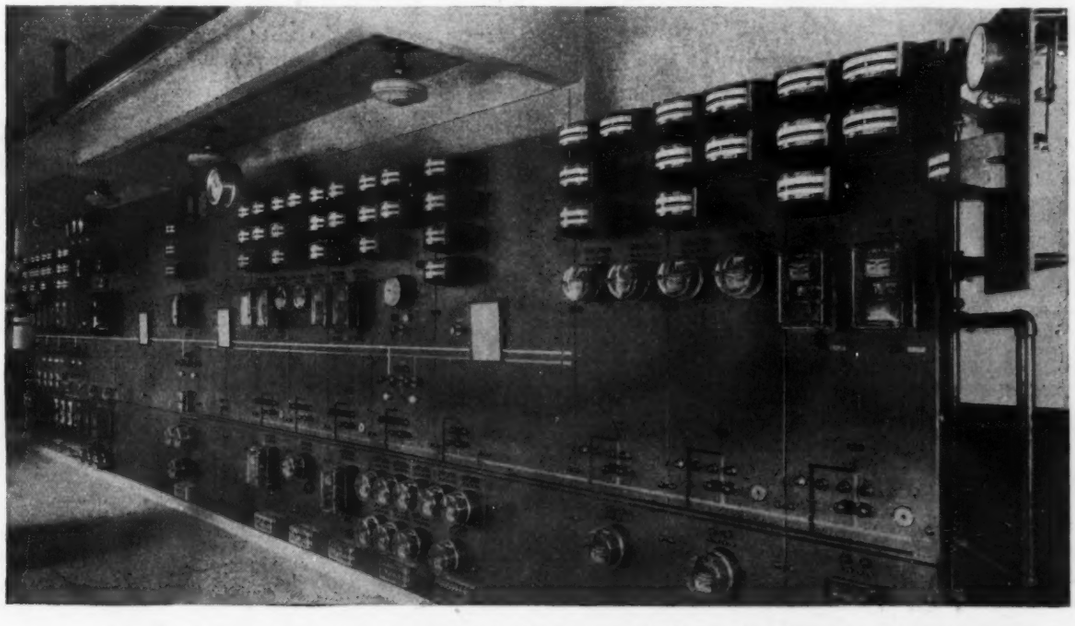
The oil-handling facilities for this station consist essentially of a Hydroil combination centrifuge and filter press of 1,200 gal. per hour capacity installed in the transformer repair house, an oil storage tank of 12,000 gal. capacity permanently installed outside the repair house, with a centrifugal pump, and two tanks of 6,000 gal. capacity, each mounted on lorries, which can be moved along the transformer transfer track. One of these tanks is equipped with a pump and connections are made therefrom to any transformer or oil circuit breaker in the station by means of a 2-in. metallic hose; thus there is no system of long headers buried underground with the possibility of unnoticed oil leaks, and requiring a relatively large amount of oil merely to fill the piping.

A satisfactorily pure water supply for the stations cannot be obtained from the near-by Grand River and accordingly a 10-in. well supplies cooling water for both banks of transformers. A 4-in. well is provided as a separate source for the control house requirements. An emergency connection to the river, however, is available in case the main supply is lost.

The engineering for this station was done by the Commonwealth Power Corporation of Michigan, under the



Blackstone substation as related to the Consumers Power system



Control board for supervision of all operations—140 kv. at left, 44 kv. at right

direction of the writer and J. H. Foote, electrical engineer, while the construction work was performed by the Consumers Power Company, under the direction of B. E. Morrow.

Laying Cables in the Ohio River

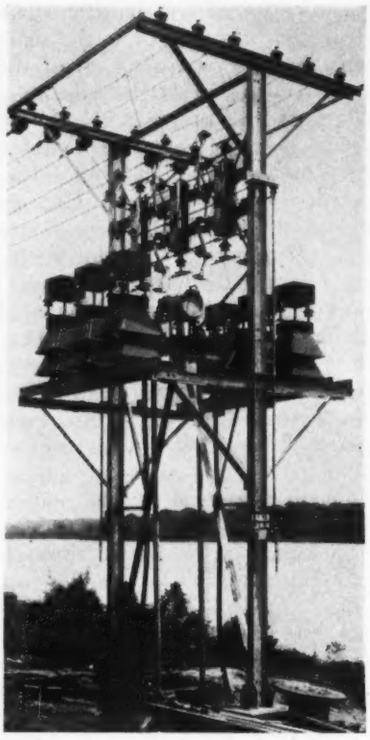
By C. C. Argabrite
Chief Electrical Engineer
Interstate Public Service Company, Indianapolis, Ind.

ON JULY 22, 1928, the Interstate Public Service Company completed the laying and putting into service of two 15,000-volt submarine cables across the Ohio River, thus interconnecting the systems of the Interstate Public Service Company and the Louisville Gas & Electric Company.

Previous to putting these cables in service the two companies were interconnected by means of one three-phase aerial cable and one three-phase open wire line attached to the Big Four railroad bridge. On account of the removal of this bridge by the railroad company it was necessary to provide other means of connection. Economic comparisons between aerial and submarine crossings proved that the laying of submarine cables would be the more economical. This was due principally to the width of the river, with its attendant high cost of crossing towers and cables and to new pole-line construction through the city of Jeffersonville.

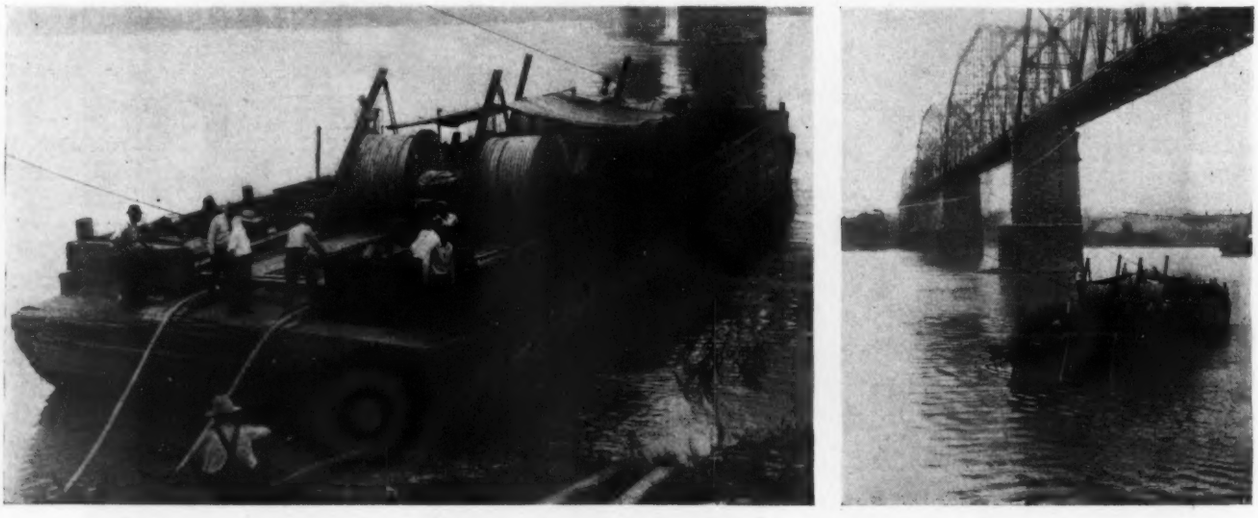
Each of the cables laid was a three-conductor, semi-sector, 250,000-circ.mil cable, oil impregnated and insulated with paper for 15,000 volts ungrounded operation, and had the usual lead covering, jute filler and galvanized steel armor. The over-all diameter of the cable was 2.92 in. and its weight approximately 14 lb. per foot. It was manufactured by the General Electric Company. Each cable was made up and shipped in two 1,400-ft. lengths and the splices were made while the barge upon which the cable reels were mounted was anchored in midstream.

A smooth wooden runway was installed upon the barge deck and at the end this runway was curved to conform to the minimum allowable bending radius of the cable. The barge was propelled by means of a Fordson tractor mounted at the bow and to the winch drum of which was attached a cable and anchor. The barge was held in line by means of hand winches, one on each end, from which side lines were run to a steel guide cable attached to the bridge piers. These side lines were equipped with steel snatch blocks which rode the guide cable. The simple method of anchoring the cables on both shores is shown in an accompanying illustration. They were clamped between two 8-ft. creosoted cross-ties about 4 ft. below the ground level. The cable end structure was designed as to general arrangement by the engineering department of the Interstate Public Service Company. The details were worked out and the structure was manufactured by the Delta Star Electric Company. The switching arrangement of this structure permits the operation of both cables on either aerial line or either cable on both aerial lines or both cables on separate aerial lines. The cable terminals are the General Electric Company's 22-kv. oil-filled potheads.



The cable end structure on the Indiana side of the river

The work of laying the cable was under the supervision of W. H. Jennings, superintendent of transmission and distribution for the Interstate Public Service Company, and the splicing of the cables and the installation of the potheads was supervised by Francis Calvert of the General Electric Company. The project was carried to completion with a minimum of trouble.



Beginning the job and holding the barge by means of steel cable attached to bridge piers

Power Needs of New England

Total industry requirements increase despite losses from textile and shoe plants. Interconnection helps economic situation. Industrial interchange of energy discussed at Boston meeting of A.S.M.E.

EVIDENCE that New England is expanding industrially notwithstanding setbacks in her textile and shoe industries within the past few years featured a well-attended session of the American Society of Mechanical Engineers at Boston recently, the keynote being a paper on "Power Supply for New England Industry" by Col. F. M. Gunby, associate Chas. T. Main, Inc., Boston. The economic aspects of power service in that section were commented upon by such men as Samuel Ferguson, Prof. Philip Cabot, I. E. Moultrop, L. L. Elden, D. S. Boyden, A. S. Moore and A. W. Milliken. In general, the speakers emphasized the importance of more complete heat balance and interconnection studies in relation to the economic supply of power to industries and considerable time was given to interpreting power price differentials between New England and other sections of the country which were featured in Colonel Gunby's paper.

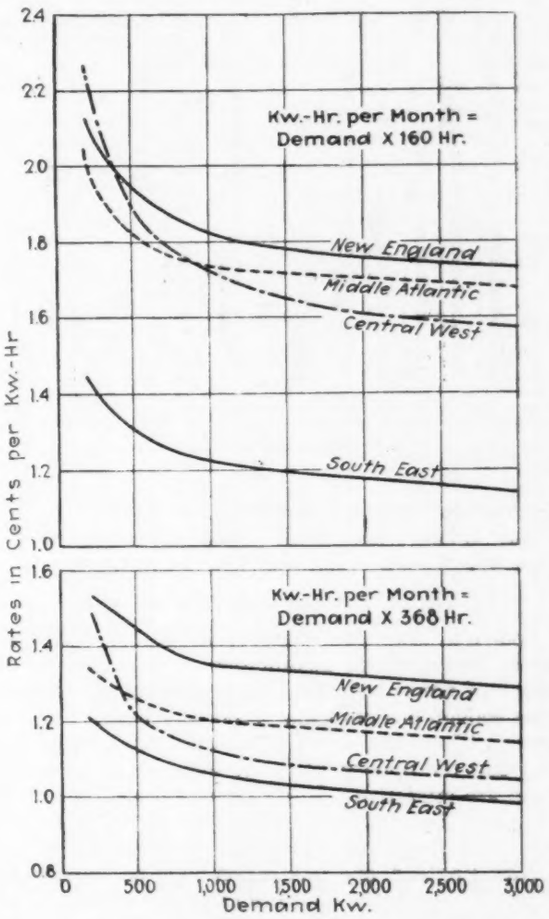
Yearly Power Increase 1.5 to 2 per Cent

The power investigating committee of the Associated Industries of Massachusetts, whose membership included Chas. T. Main, D. C. Jackson and Henry I. Harriman, estimated in 1923 that the total annual power requirements of New England, excluding steam locomotives, would increase between 1922 and 1927 from about 7,500,000,000 kw.-hr. to 8,700,000,000 kw.-hr. Colonel Gunby's paper pointed out that the committee's predictions have been closely approximated. For 1928 about 8,750,000,000 kw.-hr. will be required, of which about 5,750,000,000 will be generated by central stations and about 3,000,000,000 by the industries. Central-station output has increased annually at the rate of about 9 per cent of the 1922 total, or from 4.5 to 6 times as fast as the total power increase. About 75 per cent of the total energy generated in 1927 was from fuel, against 70 per cent five years before.

Taking Massachusetts as a cross-section, the purchased power for all industries was about 38 per cent of the total in 1922 and 43 per cent in 1925. Purchased energy in 1925 represented about 28 per cent of the power use of major industries using large amounts of process steam (woolen, paper, dyeing, finishing, rubber, soap making, sugar refining and laundry). The proportion of purchased power in all the industries of the Bay State was only 16 per cent in 1914. It will probably increase materially in the future above the 43 per cent figure of 1925.

In 1922 the cotton mills of Massachusetts operated 25,233,000,000 spindle-hours and in 1927 19,662,000,000. On the basis of 37 spindles per kilowatt, the power required in the above years was 682,000,000 and 530,000,000 kw.-hr. respectively. The decrease for all New England cotton mills was 227,000,000 kw.-hr. This loss is accounted for by plants running at part capacity, or that have liquidated, moved or scrapped older equipment. This shrinkage is still going on.

The estimated woolen mill load in New England increased from 125,000 hp. in 1922 to 145,000 hp. in 1927.



Non-weighted average prices per kilowatt-hour power service in New England and other sections. Omission of the zero axis magnifies the discrepancies

During the above five years the installed capacity in the paper and wood pulp industry of the Bay State increased about 10 per cent, or to 153,200 hp.

From 1922 to 1925 the textile industry's actual power load decreased about 11 per cent, while that of the other industries of Massachusetts increased about 15 per cent. The total load increased from 1,250,000 to 1,302,000 hp., and this is just about the increase predicted by the committee. Data for the textile mills in 1927 show only a small decrease from 1925.

Despite the substantial decrease in the use of power by New England's largest power-using industry, textiles, the growth of other industries has more than offset this loss.

From a study of the rates of various companies Colonel Gunby concluded that the cost of purchased

power in New England averages 5 to 10 per cent higher for single-shift work than in the Central West and Middle Atlantic states and still higher for double-shift work on account of the distance of New England from the fuel supply. Southern rates, he concluded, are still lower, but the author cautioned his hearers not to take these figures too literally as applying to any particular load in view of the differences in rate form, method of

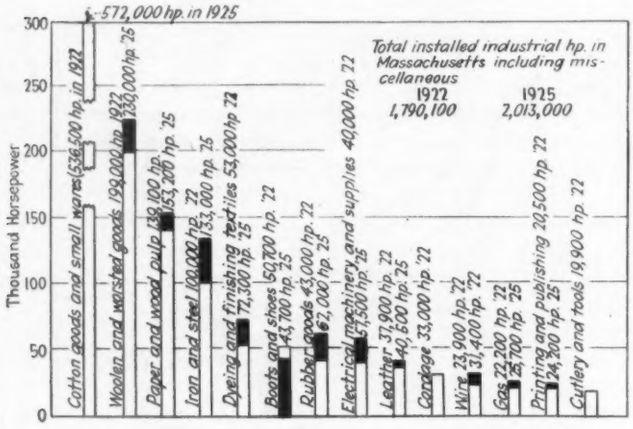

572,000 hp. in 1925
Thousand Horsepower
Total installed industrial hp. in Massachusetts including miscellaneous
1922
1,790,100
1925
2,013,000
Cotton goods and small wares 536,500 hp. in 1922
Woolen and worsted goods 199,000 hp. 1922 130,000 hp. '25
Paper and wood pulp 139,100 hp. 153,200 hp. '25
Iron and steel 100,000 hp. '22 153,600 hp. '25
Dyeing and finishing textiles 53,000 hp. '22 72,300 hp. '25
Boots and shoes 60,700 hp. '22 43,700 hp. '25
Rubber goods 43,000 hp. '22 62,000 hp. '25
Electrical machinery and supplies 40,000 hp. '22 47,500 hp. '25
Leather 31,900 hp. '22 40,500 hp. '25
Cordage 33,000 hp. '22
Wire 23,900 hp. '22 31,400 hp. '22
Gas 22,200 hp. '22 23,700 hp. '25
Printing and publishing 20,500 hp. '22 24,200 hp. '25
Cutlery and tools 18,900 hp. '22

Chart of installed horsepower in leading industries of Bay State, 1922-1925

determining demand, power-factor clauses, etc., prevailing among companies. These differences in conditions were further emphasized in the discussion.

Trend Toward Purchased Power

Touching upon the value of interconnection Colonel Gunby suggested the possibilities of more general interchange of power between central stations and industries, using enough process steam to produce marketable excess power. There is about 500,000 hp. in industries of this kind and the opportunities for eliminating considerable waste are attractive. In the author's opinion industries using less than 500 kw. do not offer anything along this line. The proportion of power purchased is increasing in New England, and this region must be fundamentally sound as long as the total use of power grows.

In the discussion Professor Cabot declared his belief that the textile depression in New England is temporary and that future improved management will restore it to its place as a consumer of power on an increasing scale. As with many other industries, the major problem is one of sales effort and co-ordination of manufacturing activities with the former. The economic importance of interconnection with centralized operation and the value of a single holding company control for a region like New England were stressed.

Discussion of Local Elements

Mr. Moultrop pointed out that the designer and builder of generating stations has a long way to go still in the pursuit of over-all dollar efficiency. He said that no isolated plant can compete with the modern central station if diversity factor is properly built up, and asserted that New England's power prices are excellent in being but a few per cent higher than elsewhere, considering the distance from the coal mines. Mr. Elden suggested that had hydro-electric plant rates been compared by the author in checking New England against the Southeast, or had off-peak industrial power rates been considered, New England would have made a more favorable showing.

Mr. Ferguson criticised the author's use of averages as misleading and cited interconnection and the purchase of excess power from industries when warranted on the basis of increment costs as lines of progress toward lower power prices. He said:

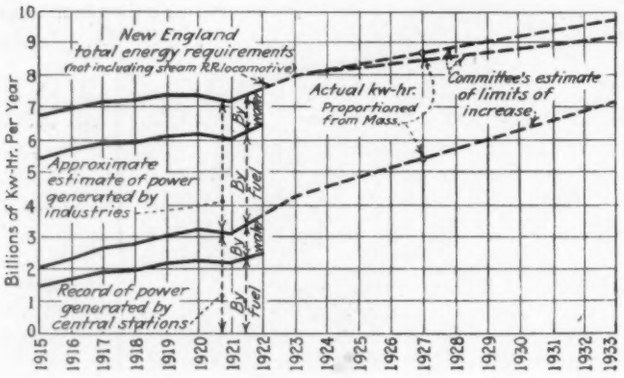
"Public utility executives in New England very generally recognize their responsibility so to conduct their business that their customers shall not labor under this handicap (higher prices for power) longer than is absolutely necessary. The relief will come from the dilution of our fuel costs with our water-power resources, but this will only be effective when interconnections are more general and more complete than at present.

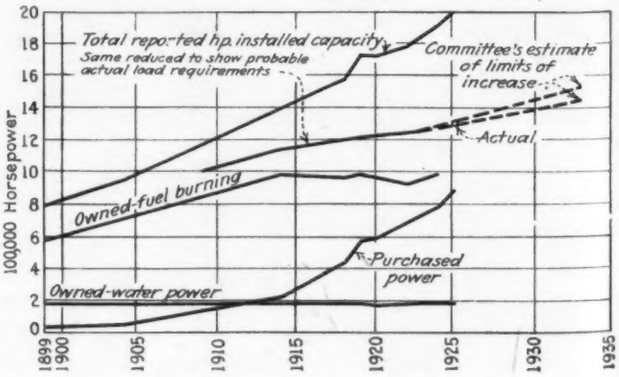
"Without interconnection the steam companies' costs are high due to the impossibility of using the seasonal full flow of our streams during every hour of the month, including Sundays and holidays.

"The start, however, has been made, but, as with every new undertaking at first, the fixed charges on the very large investment are consuming a large percentage of the benefits. It is my belief, however, that a few years will see us all well beyond this stage as every month sees an improvement over the preceding month.

"The use of averages is possibly a little misleading in comparing regional power prices as the spread of prices between companies in the same region is quite as great as the spread indicated between New England and the Middle West. . . .

"I expect to see the power companies bearing the cost of the installation of turbines to extract this (surplus industrial) power which will be used in part on the premises and in part on the system, and the savings


Billions of Kw-Hr. Per Year
New England total energy requirements (not including steam R.R. locomotives)
Actual kw-hr. Proportioned from Mass.
Committee's estimate of limits of increase
Approximate estimate of power generated by industries
Record of power generated by central stations
By water
By fuel
By fuel



Growth of New England power requirements and power capacity in Bay State industries

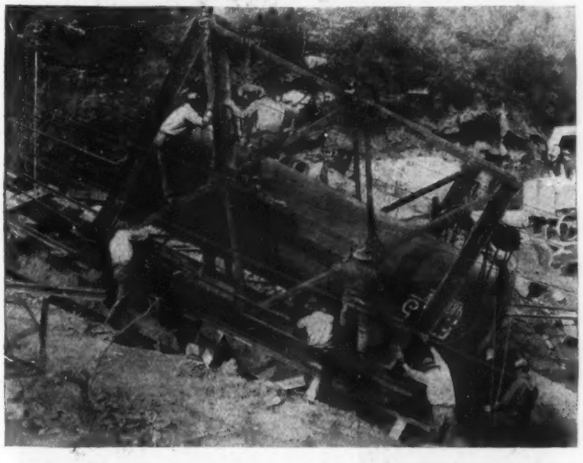
effected equitably divided after the carrying charges on the turbine are absorbed. The extent of the saving to the power company is the increment cost only—a point which the industries have not been ready to recognize in the past, and which has hitherto held back the use of central-station load to absorb surplus power from process steam."

Other speakers enlarged upon the possibilities of absorbing excess industrial power into central-station systems and the importance of competent engineering analyses of heat balances in determining whether to purchase or manufacture power in industrial establishments. Methods of analysis and policy elements connected with interconnection of industrial and utility plants were discussed.

Heavy Penstock Laid with Gantry Crane

DIFFICULTIES of laying heavy sections of forged penstock at the Big Creek No. 2-A plant of the Southern California Edison Company were successfully and economically solved by the use of a gantry crane, as illustrated. A track approximately 8 ft. in gage was laid over the penstock trench on which to operate the special crane.

The pipe sections were transferred to the gantry rig by rolling from an incline car at a station on the tram line, where they were picked up by four 10-ton chain blocks fastened to the upper members of the crane. The heavy cable was then uncoupled from the incline car and used to lower the gantry car down the penstock line with a section of pipe. By means of the chain blocks the pipe was lowered into place for bolting of the flanges. The heaviest single section of pipe weighed 27 tons. However, bends were bolted to adjacent sections of pipe, making the heaviest single loads about 35 tons. The penstock varies in diameter from 9 ft. at the top to 5½ ft. at the lower end, and in thickness of plate up to 3 in.



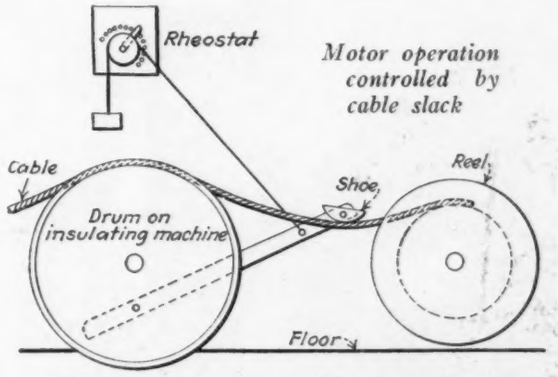
Placing heavy penstock section by means of chain blocks on specially built gantry crane

This method of laying the penstock proved most economical since it was impracticable to lay a standard gage track on either side of the line and roll the sections into place on account of the amount of rigging that would have been required.

Automatic Control Applied to Cable-Reeling Job

By L. Stone
General Electric Company, New York, N. Y.

AT THE Yonkers plant of the Habirshaw Cable & Wire Corporation an automatic wire-insulating machine is used for the application of soft rubber tape to stranded cable. The starting operation was controlled by a limit switch which closed when the rheostat arm was moved away from the full-field position by the loosening of the cable as the insulating machine started. This arrangement caused severe jerking of the cable caused by a "hunting" action as the machine came to rest. Coasting of the insulating machine was largely responsible, as the reel motor would stop when the machine slowed down and would then start with a severe jerk.



The reel motor speed is controlled by a field rheostat operated from the shoe resting on the cable between the machine and the reel. When the cable becomes slack, the shoe drops and speeds up the motor, and *vice versa*. A large speed ratio is provided so that both large and small reels can be used without changing the gear ratio.

To overcome this trouble and to give an even start and stop, an additional step of resistance was added to the armature circuit of the reel motor to reduce the speed on starting and stopping. This resistance is shorted by an alternating-current contactor, the operating coil of which is connected in parallel with the second accelerating contactor coil on the insulating machine control panel. During the jogging operation in the insulating machine, the alternating-current contactor is open and the reel motor runs at slow speed. When the machine reaches full speed the resistance in the reel motor circuit is shorted and the speed is controlled by the field rheostat operated by a shoe, as shown in the illustration. When the "stop" button is operated the resistance is inserted and the reel motor slows down. Much smoother operation was had by eliminating the dynamic braking feature and setting the shoe to compensate for the coasting of the reel motor.

Cost of Control Battery

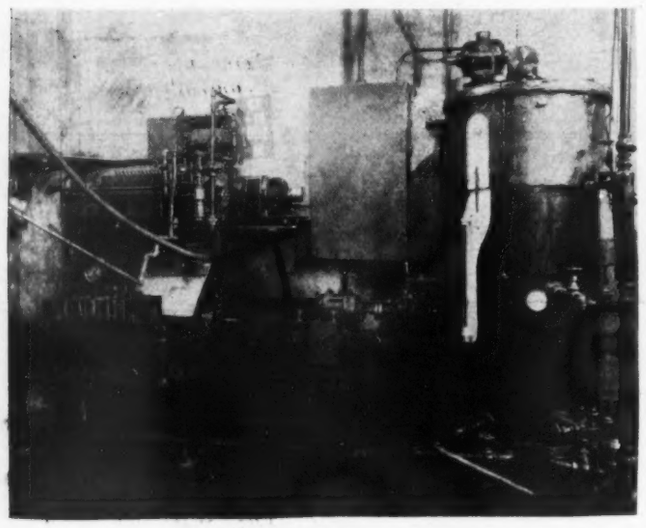
(New England Station, January, 1928)

One Electric Storage Battery Company 60-cell E.M.G.O.-7 oil switch battery complete, with two-tierwood racks	$1,104.75
Labor and expense of installing mat	40.00
Freight	45.08
Labor	47.22
Insurance	1.99
Transportation to site of use	15.95
Total	$1,254.99

Fuller's Earth Filter Reclaims Insulating Oils

By Claude A. Warren
Portland Electric Power Company, Portland, Ore

DIRTY, burned and otherwise impure transformer oils are now being refined and purified in the transformer department of the Portland Electric Power Company, Portland, Ore., through an inexpensive but unusually effective refining plant. The ordinary centrifugal and blotting paper press methods of refining oil did not give complete satisfaction, as some oils retained enough colloidal carbon even after being passed through the blotting paper presses several times to render them unfit for use. To make possible reclaiming all of the oil refined the apparatus illustrated was constructed and placed in service some time ago.



Oil filter salvages transformer oil at a cost of approximately 3½ cents per gallon

This machine consists of a tank equipped with steam heating coils, a mechanical adjuster, gages and a vacuum pump. Used oil after having been put through a blotting paper press to eliminate heavy solids is drawn into the machine together with a charge of fuller's earth (hydrous aluminum silicate) amounting to one-third to one pound per gallon of oil. The agitator is set in motion and the temperature of the oil is gradually raised to a point where the more volatile oils, such as gasoline, and most of the water will be carried off. This process is aided by the vacuum pump, which performs the dual service of carrying off the vapors and reducing the pressure and consequently the temperature at which these impurities will vaporize. Burned oil is further refined by forcing live steam through the oil, which carries away all burned odors. After treatment in the tank for a period varying with the condition of the coil (from two to four hours), the oil is forced through a filter press using a finely woven canvas. This press retains most of the fuller's earth and carbon formerly in suspension. A passage through the blotting paper completes the process.

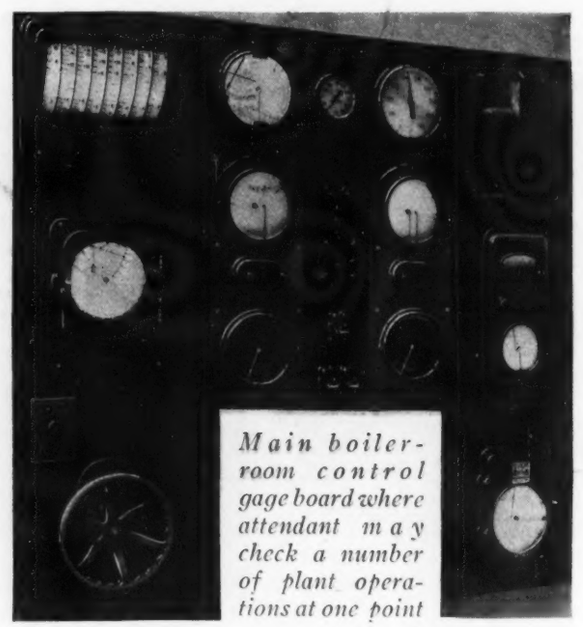
By this method more than 7,000 gal. of oil, some of which was apparently too bad to reclaim, has been salvaged at a cost of approximately 3½ cents per gallon. Careful manipulation has made possible refining some of the older, heavier oils until they very closely resemble modern, lighter oils. This same apparatus can be used for re-refining automobile and machine oils, although the cost of refining will be somewhat higher than that for transformer oils.

Grouping of Steam Gages Saves Operating Labor

By E. Woodbury
Stone & Webster, Inc., Los Angeles, Calif.

IN DESIGNING steam plants the steam engineer is just now getting around to doing what the electrical engineer has been doing for many years—the grouping of instruments so that the operator may check a number of operations at one point. In the Long Beach steam plant of the Southern California Edison Company all gages and meters having to do with a certain function of the plant were grouped in the manner shown in the accompanying illustration. A number of such boards were installed, included among which are the master boiler-room gage board (illustrated), boards for each of the three boilers, boiler feed-water gage board, condenser gage board, circulating water gage board, make-up and draw-off gage board, evaporator gage board, liquid-level gage board, several steam-valve control boards, fuel oil gage board, turbine gage board, generator fire-extinguisher board and an emergency steam-control board located near the main exit to the boiler room. The purpose of the latter board is to enable shutdown of the entire plant in case of serious accident.

Construction of the boards themselves is of special interest. Strips of No. 12 gage furniture steel varying in width from 12 to 39 in. and of proper length were assembled into instrument boards of the desired size.



Main boiler-room control gage board where attendant may check a number of plant operations at one point

The lengthwise edges of the panels were bent at right angle to permit fastening adjacent panels. The use of furniture steel is of great importance, since it is the only kind of thin steel plate that can be assembled into a perfectly flat instrument board. The results from centralizing the steam instruments have been very satisfactory.

The World Power Conference

London meeting has good papers on power production. Fuel session for production of electricity created greatest interest. Digest of papers and discussions

THE Fuel Conference which has just been held in London, Sept. 24 to Oct. 6, under the presidency of Lord Melchett, is the second sectional meeting and the third session of the World's Power Conference, so successfully initiated at London during the Wembley Exhibition, July, 1924. The second session, at Basle in 1926, mainly concerned itself with hydro-electric and inland water transportation developments, while the third session, just completed, considered the fuel problem in its many aspects.

The scientific and practical sides of the problem were covered at length by papers from many of the 48 nations taking part in the conference and the economic side was distinctly stressed in more than half of the 150 papers presented. To these papers must be added the nineteen general reports, each summing up the papers presented at a session and written by a well-known authority on that particular branch of the subject. These general reports are a most necessary part of such conferences, since the papers are rarely in print before the opening day of the conference and are not available for careful reading before the meeting. At this conference there was no author's presentation of papers, but the papers presented for each session were reviewed by the general reporter and the discussion was then opened by the vice-chairman. It was also an innovation for the general reporter to put at the end of his report the subjects to which the discussion should be confined, and as a rule the discussion centered along only a few of the topics so presented. From ten to fifteen discussions filled the remaining two hours of the session.

Fuels and Their Utilization

The main sections of the conference cover, first of all, the coal industry itself, with its problems of sampling and testing, treatment, sizing and preparation, storage and handling; secondly, the practical utilization of fuels for industrial, commercial and domestic purposes, and, thirdly, oil, peat, alcohol and other industrial fuels. The subject coal accounts for more than two-thirds of the material presented for discussion and it is here that the clearest indication of progress has been shown. Research and developments on combustion methods have realized higher thermal economies, especially in connection with the generation of electricity, in high- and low-temperature carbonization processes and in the utilization of low-grade fuels. In the sections on the domestic use of solid, liquid and gaseous fuels the great diversity of conditions has led to a most diverse statement of aims and practices, which have been ably dealt with by Dr. Margaret Fishenden, the general reporter for Section L, who estimates that 15 per cent of the coal mined per annum is used in its raw state for domestic purposes. In the discussion the diversity of opinion due to the differing conditions in the various countries was most marked.

The carbonization industry was well represented by three sections, in which the discussion was full and interesting. High- and low-temperature carbonization and the gas industry itself were well represented in the papers, while the industrial utilization of the gaseous products was covered by Section K and brought forth an unusual amount of good discussion.

The oil industry, cracking, anti-knock gasoline and the internal combustion engine were given four sections, which, were largely attended, while peat and alcohol were each covered at a single session. Interesting sessions on long-distance transmission, waste heat recovery, fuel organizations and the training of fuel technicians were well attended.

Fuel for Electrical Generation

Utilization of fuels for steam generation and the production of electricity, under the chairmanship of the Hon. Sir Charles A. Parsons, with Prof. G. Stoney as general reporter, created the most interest and brought out the largest attendance. The chief paper, the "Economic Utilization of Fuel in the Production of Electricity," by R. P. Sloan of Newcastle-on-Tyne, is particularly noticeable as following up the paper of Sir John Snell at the British Association for the Advancement of Science at Oxford two years ago. Mr. Sloan dealt with the underlying principles of central-station economy, stressing the fact that to produce electricity at the lowest cost the proportion between capital and other charges and the cost of fuel must be such as to result in a minimum. He repeats the familiar analysis of Unwin and Wordingham showing fuel cost in the case of the small householder not exceeding 4.6 per cent of the total cost, while in the case of the large consumer it may be 46 per cent of the total. Recommendations as to the lines along which further economies may be sought include avoiding waste heat losses, preheating combustion air, the regenerative cycle, reheating between stages, and higher steam pressures and temperatures. Pulverized fuel, stokers, back-pressure turbines and other features of station design and operation were treated.

Perhaps the most interesting sections of Mr. Sloan's paper were those treating of the low-temperature carbonization plant in connection with the Dunstan power station at Newcastle-on-Tyne, where coal is treated to remove the byproducts and the resulting coke and gas are used under the boilers in the raising of steam. The plant at Dunstan consists of four B & W boilers, two of a capacity of 18,000 lb. of steam per hour and two of 30,000 lb. per hour. One of the 30,000-lb. boilers is arranged for powdered coal operation, while the four distillation retorts are arranged in front of the three other boilers, the 30,000-lb. boiler having two retorts, while the 18,000-lb. boilers have one each. The 18,000-lb. boiler retorts have each a capacity of 20 tons of coal per day. The retorts in front of the 30,000-lb. boiler are 50 per cent larger and each handles 30 tons per day. The complete plant can therefore carbonize 100 tons per day and the coke is available for the three boilers. The fourth 30,000-lb. boiler, being powdered coal-fired, is suited to peak loads and thus enables a

steady load to be maintained on the three coke-fired boilers. Northumberland "rough small" coal is used and on delivery the fines are separated, dried and pulverized for use in the powdered coal-fired boiler. The larger coal (¼ in. and up) is used for feeding the retorts. This coal is heated in a brick housing on a chain grate stoker about fifteen minutes before being fed to the retorts by a screw conveyor through a rotary valve which acts as a seal. The distilling medium consists of a mixture of steam and the products of combustion from the burning of coke oven gas in a small combustion chamber arranged under each retort. Steam at atmospheric temperature, part of which is obtained by quenching the hot semi-coke in its passage to the stoker hoppers, is used to regulate the temperature and the composition of the distilling gases. The coal takes about three hours in its passage through the retort and is discharged continuously through a sealing valve by a screw conveyor to the stoker hopper. The distilling gases and volatile products of the coal are removed by an exhauster and passed through a tar extractor before being burned under the back end of the boiler. Mr. Sloan gives the following figures based on prices ruling in the first quarter of 1898:

Value of derivatives from 1 ton (2,340 lb.) of coal.

	Shillings	Pence
1 gal. motor spirit at 1s. 2d	1	2
1.0 gal. White spirit at 1s. 1d	1	1
1.43 gal. crude paraffin at 3¾d		5.36
6.88 gal. creosote at 8¼d	4	8.76
5.0 gal. pitch at 5.38d	2	29
0.507 gal. cresylic acid at 1s. 8d		10.14
	10	7.6
Cost of process:		
1 ton coal	12	0
Cost of conversion	4	8
	16	8

He gives no figures as to fixed charges, and Professor Stoney in commenting on the paper says that "no important commercial economies have been obtained." Rough figures would indicate a fixed charge equivalent to the operation and maintenance charge and it is for this reason that the comment of the general reporter was made.

It was rumored at the conference that the Babcock & Wilcox Company, Ltd., had purchased the entire rights to the process and would very shortly place it on the market.

High Pressure and Temperature

A useful paper on the "Utilization of Liquid Fuel for Steam Generation," by Commander Mark - Wardlaw, R.N., dealing mainly with marine practice, brought forth some discussion.

This session also contained the paper by Dr. J. Havlicek on "Research with High Pressure Steam," in which he gave the results of the work done since 1924 at the University of Prague, Czechoslovakia, by Dr. Zvonicek and the author. The work includes a number of points at 100-202 and 253 atmospheres extending to 500 deg. C. (930 deg. F.). In the discussion which followed, I. V. Robinson told of the work of the English investigators and George A. Orrok of the work of the Steam Table Fund (A.S.M.E.) in America. The general reporter expressed the desire of all parties for international co-operation in the checking and formulation of the results of this work.

The pulverized fuel session, under the chairmanship of Archibald Page, with Arthur Grounds as general reporter, was also well attended. Nine papers were presented, all by well-known engineers. Dr. Forderreuther and Dr. Luloffs covered the design of the combustion chamber, starting from the fundamental equations, heat transmission through brick walls, while the water-cooled walls were discussed by Rosencrantz and Kreisinger and Frisch. Both Ramzen and Rosencrantz drew attention to the elimination of the drier and the successful realization of drying in the mill itself. The paper of Rosencrantz is particularly valuable as it embodies all of the latest information on a large number of plants, the particulars of which have not previously been made public. The paper of Renkin on the use of powdered fuel in metallurgical plants is quite exhaustive. He calls attention to one point which has been apparently overlooked, that unless a coal has been thoroughly well dried it is useless to grind very finely, as the particles agglomerate on injection into the furnace and burn as coarse particles of coal. Lieutenant-Commander Brook's paper on "Pulverized Fuel in Marine Use" describes the results obtained during the recent runs of the *Mercer* and draws attention to the fact that for marine service the plant should be much more robust than for land use. While it is too early to say pulverized fuel in marine use is an unqualified success, enough has been learned to predict that the application will increase rapidly.

Low-Temperature Carbonization

Low-temperature corbonization, under the chairmanship of Mr. Guillaume, with F. S. Townsend as general reporter, excited considerable attention. The three papers covered British and German practice and were most exhaustive. The many plants in Germany treating lignite and brown coal and the sixteen plants in England were described, with many operating figures. The third paper, by Dr. Rosin, who has just arrived in this country, covers the co-ordination of low-temperature carbonization and electric generation in one and the same plant, so well exemplified in the Böhlen plant of the Sächsische Elektricitätswerk A.G., and other installations in the brown-coal fields of Germany. He deals both with the underlying principles of combined operation and its practice as the development has proceeded in Germany. The paper is reminiscent of Klingenbrug's paper of 1916. He lays down four principles as governing all co-ordination: (1) Co-ordination must lead to a lowering of the cost of the main product as compared with that in independent works; (2) one of the processes to be co-ordinated must be dominant and the other subordinated to it; (3) as many as possible of the main, intermediate, and byproducts must be used interdependently, and (4) the economic weaknesses of the individual process must be neutralized as far as possible. In applying these principles to the production of electricity it is clear that co-ordination must lead to a cheaper total cost per kilowatt-hour. The demand for current is the dominating factor and the low-temperature carbonization processes must facilitate the meeting of peak-load requirements and raise the average load. From a consideration of the values of the products from various forms of thermochemical processing Dr. Rosin concludes that the only forms which can be economically co-ordinated with electric power production are the low-temperature carbonization of lignites and non-coking coals. Since low-temperature coke from non-coking coals will always bring a better price for household purposes than for use in electric power stations, the co-ordination is essentially confined to lignites and brown coals.

The paper by Drs. Lander and Sinnatt covers most of the ground of the fuel research reports and concludes that "while from the technical aspect low-temperature carbonization plants can be worked at a price to produce coke, tar and gas in adequate quantities and qualities, we still await the results of long period commercial operation, selling the products on the open market and producing actual profits to the shareholders.

The important statement is made that investigations of low-temperature tar do not appear at this stage to have revealed any special feature likely to raise its commercial value above that of high temperature." The paper concludes: "There are undoubtedly local conditions in various parts of the world under which a plant can be expected to be a commercial success, but to what degree low-temperature carbonization may develop as a real factor in national fuel utilization time only can tell."

Transmission of Power

The transmission of power session, under the chairmanship of Dr. C. Köttgen, with the same general reporter, presented two papers on bulk gas transmission and a third paper by Dr. E. W. Smith, who compared the cost of transmission or shipment of coal, coke, oil, gas and electricity under the conditions obtaining in Britain. His figures suggest that there are certain limits of distance within which the bulk supply of gas and electricity will be confined. As regards the long distance transmission of gas the technical problems are largely solved, but in the case of Great Britain there are formidable legal difficulties which must be surmounted before bulk supply of gas becomes practical politics.

Training of fuel technicians session, under the chairmanship of Sir Robert Hadfield, with E. C. Evans as general reporter, offered five papers, two on the college training of fuel engineers and three on the Steam Users' Associations, research associations and technical organizations, similar to the prime movers committee of the N.E.L.A. Much interest was shown in the work of this section.

In Section W Sir Arthur Duckham attempted to lay down a fuel policy for Great Britain which may be summarized in the following paragraphs, some of which should be interesting from the American standpoint:

(a) It is necessary that both the producers and consumers of fuel should avail themselves of the specialized knowledge of technically trained men. There must be understanding of fuel qualities and knowledge as to its economic utilization.

(b) The producers must get together to rationalize the raising and distribution of coal. Large concerns which can best avail themselves of mechanical handling and expert knowledge are in the most favored position for reducing costs of production.

(c) Every effort should be made to encourage producers to supply clean coal. This not only helps the purchaser to utilize the fuel to the maximum effect with the minimum expense, but also insures to the producer of coal a better and more secure market.

(d) All coal should be graded at the colliery, and in order that the underground working costs may be reduced, modern methods for the utilization of the smaller sizes should be pursued, resulting in enhanced value of these hitherto less valuable grades.

(e) Post-war developments in coke-oven practice have shown the economies which result from the operation of large units. The best results are obtained in working units of from 800 to 1,200 tons of coal per twenty-four hours in quick-coking ovens, situated, if necessary, at a centralized position in relation to the various sources of supply.

(f) In many cases coke quality from a coke-oven plant can be improved by blending suitable coals together. This makes it possible to carbonize non-coking coals, thus increasing the range of coals available. From blended coals it is also possible to produce an alternative to low-temperature fuel, in the form of a smokeless free-burning fuel which should be cheap to produce.

(g) The surplus gas resulting from the carbonization of coal in modern coke ovens should be utilized wherever possible for industrial or domestic needs. By co-operation between coke-oven owner and gas undertaking it should be possible to arrange satisfactory conditions of supply.

(h) There is a need for a government investigation into the possibilities of the installation of bus mains to collect and distribute coke-oven gas over long distances and large areas, such, for example, as Lancashire, Yorkshire and the Midlands.

(i) The ever-increasing demands of pulverized fuel firing will lead to an enhanced value of cleaned small coals, the use of which obviates many of the difficulties associated with the process. The possible use of pulverized fuel for marine boiler work, which may lead to a reduction in demand for bunker oils, will be watched with great interest.

(j) In connection with the electricity grid schemes consideration should be given to the possible utilization of the low-grade fuels, produced in the cleaning of coals for the generating of electric power in stations erected at the collieries to obviate the transport of the low-grade fuels.

(k) Much has been said and promised in the past concerning low-temperature carbonization, but comparatively little has yet been accomplished. The results of the energetic work which is being done in this country at the present time will be awaited with interest. The disadvantage hitherto has been the high price of the solid fuel in relation to the products from the well-established high-temperature processes.

(l) The gas industry should pay increased attention to their coke sales. Clean coal gives a clean and easily ignitable coke. Constant quality and suitable sizing make the fuel acceptable to the user, and every gas undertaking, by taking thought and trouble, should be able to dispose of all the coke equivalent to its gas output in its own area.

(m) Gas undertakings should be enabled to make such terms with the large-scale users of gas as would encourage its general utilization in industry.

(n) An increase in the number of combined coke-oven and iron and steel works in this country would lead to economies. The installation of coke ovens near the iron and steel works provides an ideal fuel for steel furnaces in a form of coke-oven gas.

(o) Greater financial backing to the admirable fuel research organization set up by the iron and steel industry would make its findings and development more quickly available to those in charge of operation.

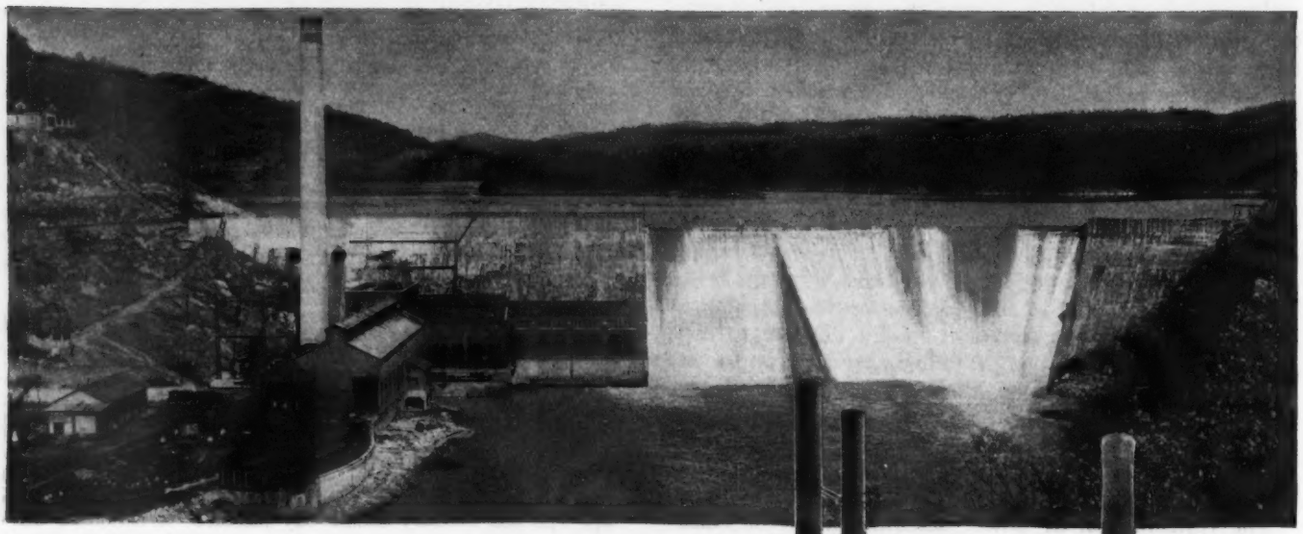
(p) A general speeding up, reduction of costs and greater facilities in the transport of fuel, subjects which are being closely examined by the government standing committee on minerals transport, will, when attained, have a beneficial effect.

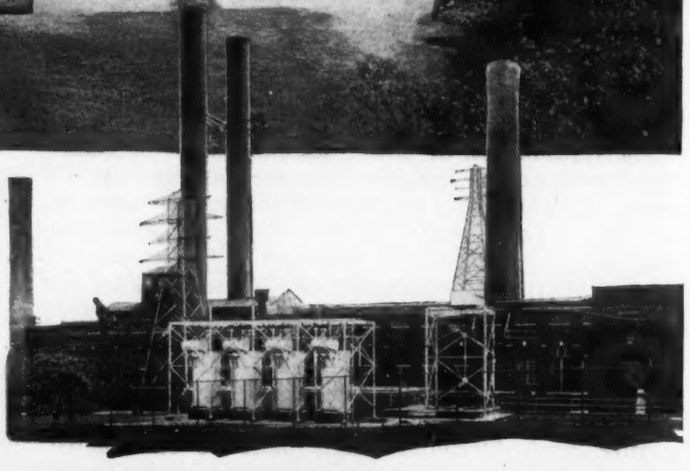
Inspection Trips and Social Events

The organization of the conference, with Lord Melchett as president and D. N. Dunlap as chairman of the Fuel Conference Committee, has been most excellent. The general secretaries, Messrs. Ogilvie and Burt, and the technical secretaries, Drs. Smith and Fottrell, were most efficient. In the unavoidable absence of Lord Melchett, the Marquis of Reading presided and the opening address was delivered by the Right Hon. Sir Robert Van Horne. The social events, conducted with the usual English formality, consisted of a complimentary dinner to the visiting delegates at Connaught Rooms, a government reception at Lancaster House by the Right Hon. Sir Philip Cunliffe-Lister, president of the Board of Trade, and Lady Cunliffe-Lister, and a reception at the Hotel Cecil by Lady Melchett and Dr. Robert Mond, were most enjoyable. The complimentary dinner to the British delegation by the visiting delegations at the Hyde Park Hotel completed the social functions.

Visits to the Port of London, the Rothampstead Experimental Station, the Gas Light & Coke Company, the County of London Electricity Supply Company, Barking Station; the Fuel Research Station, the National Physical Laboratory, the Anglo-Persian Oil Company's laboratories and the Newcastle-on-Tyne electric stations were scheduled on days when no sessions were held and were fully attended.

All of the technical sessions were held at the halls of the Imperial Institute, South Kensington, and most of the visitors availed themselves of the opportunity to visit the various museums of science housed in the South Kensington group of buildings.



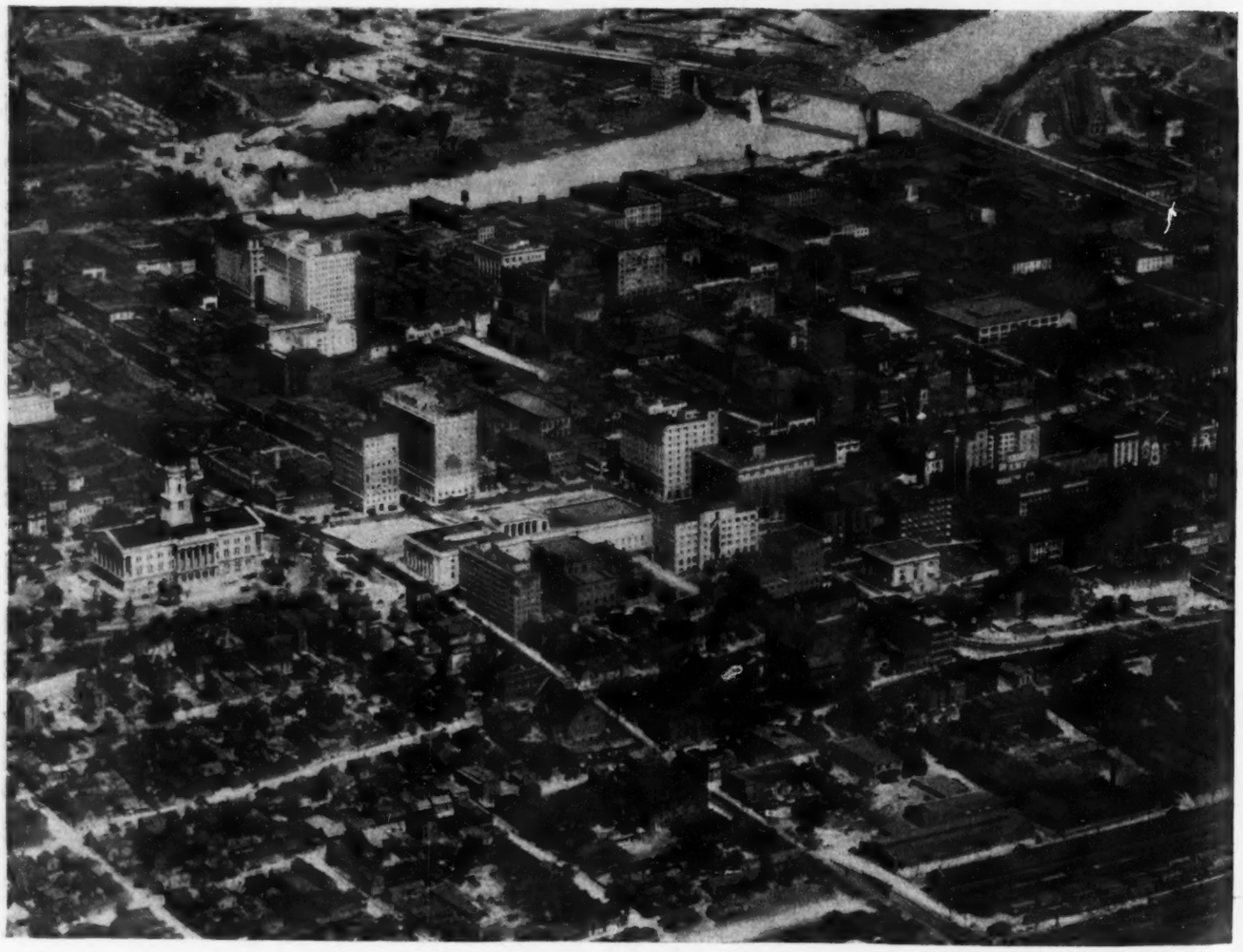


Tennessee Growth Requires More Electric Power

Above — Combined hydro and steam plants of the Tennessee Electric Power Company at Parksville, on the Ocoee River.

Center—A new outdoor substation of the Nashville Railway & Light Company with steam plant in rear.

Below—The city of Nashville.



Courtesy Nashville Aeronautic Corporation

British National Fuel and Power Report

WHILE the Fuel Conference at the Imperial Institute, South Kensington, brought together the representatives of 48 countries to express their views and state their problems on the subject of fuel and power, it is interesting to note that a general survey of the fuel and power situation in Great Britain has been going on under the direction of the Board of Trade. The National Fuel and Power Committee, which was appointed by Sir Philip Cunliffe-Lister, the president of the Board of Trade, in August, 1926, with Sir Alfred Mond, now Lord Melchett, as chairman, "to consider and advise upon questions connected with the economic use of fuels and their conversion into various forms of energy having regard to national and industrial requirements, and in the light of technical developments," has just made its first report to Parliament. This report, a pamphlet of 37 pages, presents a most interesting set of facts and recommendations.

Leaving out the strike years of 1921 and 1926, the coal output has varied from about 230,000,000 tons to 277,000,000 tons, a matter of about 17 per cent. Coal exported has varied from 50,000,000 tons in 1920 to 108,000,000 tons in 1923 and was about 70,000,000 tons in 1927. Home consumption has not varied much from the 1913 figures of 183,800,000 tons, was at its lowest in 1922, when only 157,700,000 tons were used, but has kept near the 179,500,000 tons figure of 1927. The coal consumption of gas works varies little from 16,500,000 tons, railroad coal about 13,500,000 tons, domestic use about 40,000,000 tons. The central-station use of coal has increased from under 5,000,000 tons in 1913 to about 9,000,000 tons in 1927. The use of gas has increased from 215,400,000,000 cu.ft. in 1913 to 297,700,000,000 cu.ft. in 1927. The output of electric current has increased from 5,167,300,000 kw.-hr. in 1921 to 9,927,900,000 kw.-hr. in 1927, an increase of 92 per cent, while the central-station use of fuel in the same period has only increased about 25 per cent. There still remains approximately 80,000,000 tons of coal used in industry, mainly for steam raising, with very little data as to efficiency except that the use is extremely wasteful. The report comments on the increase in efficiency of operation in the pig iron and steel industries.

Fuel Research in Germany

The report includes chapters on research, fuel economy in Germany, with particular reference to the work of the Warmestelle, a fuel-control department in connection with the Association of German Iron and Steel Manufacturers, and preparation of coal for the market, where a strong plea is made for better preparation and selling on specification. The chapter on low-grade fuels refers to fines and pit wastes, which is estimated at 40,000,000 tons per annum. The chapter on carbonization is a useful review of the coke-oven industry, covering also the long-distance transmission of gas. On the subject of domestic fuel, the members of the committee feel that their investigations have not been sufficiently detailed to enable them to come to any definite conclusion or make any recommendations on the subject.

Chapter VIII, on fuel for steam generation, sets forth the fact that one-third of the horsepower and one-seventh of the coal are accounted for by the central-station industry. The committee stresses the use of higher pressures and temperatures as having been justified by the increased efficiency of generation and it includes a table showing increases in thermal efficiency from 17.6 per cent in 1921 to 27.3 per cent in 1926. Of the seven stations quoted, four are from the United States at pressures of 550 lb. and over. The firing of pulverized fuel is referred to favorably, and particularly its use in the S.S. *Mercer*. Government backing of experiments in the use of higher pressures and pulverized coal firing in marine service is urged.

Conclusions and Recommendations

The main conclusions and recommendations in the body of the report are here briefly summarized:

1. Information regarding fuel consumption in industry is important and details should be obtained of the amounts of fuel used and the purposes to which it is put.
2. The coke oven industry should institute, by the formation of a national research association embracing the existing local associations, organized research into coking problems.
3. The fuel industries should consider the need for co-operation with the universities by indicating the responsible situations that are open on the executive side of their businesses for men trained in fuel technology. The Board of Education should also consider what might be done in the institution supervised by it to contribute to the training of men with the desired qualifications.
4. The iron and steel industry should give greater support to its fuel economy committee, both by providing it with sufficient funds and by actively co-operating in its work.
5. All large coal-consuming industries should consider the desirability of adopting on a much larger scale than at present the practice of an exchange of experiences in fuel technology, if possible through central associations financed by small levies.
6. Buying and selling of coal by specification is recommended and the suggestion is made that colliery owners would benefit their customers, and in the end themselves, by a classification of coal, according to some agreed standard.
7. Each district coal owners' association should, in conjunction with the Electricity Commissioners, consider in what way it could take part in electricity development.
8. The possibility of the use of low-grade fuel should be considered by both old and new electricity generating stations.
9. Coke oven owners should consider the consolidation and modernization of the older coke oven plants with reference to the most suitable location.
10. The government should undertake an investigation for a limited area, such as that lying between Liverpool and the Humber and between Leeds and Birmingham, of the technical and economic aspects of an area gas supply system including an interconnected network of pipe lines fed by gas works, coke ovens, and the like.
11. Every endeavor should be made by the mining and shipping interests and by the government to further experiments in the use of high-pressure steam and pulverized fuel in ships of different types.

The report is signed by Lord Melchett as chairman, Frank Hodges as deputy chairman and John Baker, Mark Brand, Sir John Cadman, Sir Arthur Duckham, Sir W. E. Hart, Prof. F. A. Lindemann, M. Mannaberg, C. H. Mertz, Sir Alexander Walker and Sir David Milne Watson, and Messrs. W. Palmer and R. J. Moffat as secretaries.

Protective Railings

ON MANY substation and power house construction jobs there are places, such as galleries and light wells, when the job is completed, that will be protected by ornamental railings. During construction these places must be protected. It is not wise to install the ornamental railings while construction is going on if it is desired that they be ornamental when it is finished. The usual practice is to put up temporary wooden railings made of two-by-fours or such other lumber as is handy. But wooden railings are not solid; they break easily, and it has happened that if a carpenter wanted a piece of

scantling very badly he has sawed it out of the railing. In the construction of Delray power house No. 3 by the Detroit Edison Company the hazard of wooden railings around the machine and light wells in the turbine room was very easily and cheaply avoided. In the boiler room all stairways and walkways are provided with permanent welded pipe railings, and by advancing delivery dates on these and rearranging erection on certain portions of boiler room steelwork enough railings were borrowed for temporary use in the turbine room. When the ornamental railings were finally installed, the pipe railings were removed to their permanent location in the boiler room.

Selecting Conduit Sizes for Wires and Cables

By Max Kushlan*
Boston, Mass.

THE determination of minimum safe conduit sizes for insulated conductors, assuming average conditions for pulling, may be simplified by the use of a table based on space factors corresponding to the number of wires in a single conduit.

The relation between the inside diameter D of a conduit, the outside diameter d of each wire and the space factor M for any number of conductors in the conduit is given by the expression:

$$D = Md$$

where M depends on the number of wires.

The largest wires that may be safely pulled in a conduit of any given size may be computed by the formula:

$$d_{max} = \frac{D}{M}$$

The table given below enables the designer to pick the proper conduit size for a given number of wires, each having an outside diameter d, or to determine the maximum number and size of wires that may be safely run in a conduit of a given size.

The space factors M are based on computations and full-size layouts of wires in a conduit, allowing an average excess area of 35 per cent over the required minimum. The pulling conditions are assumed to represent runs from 50 ft. with two 90-deg. bends to 150 ft. with one 90-deg. bend.

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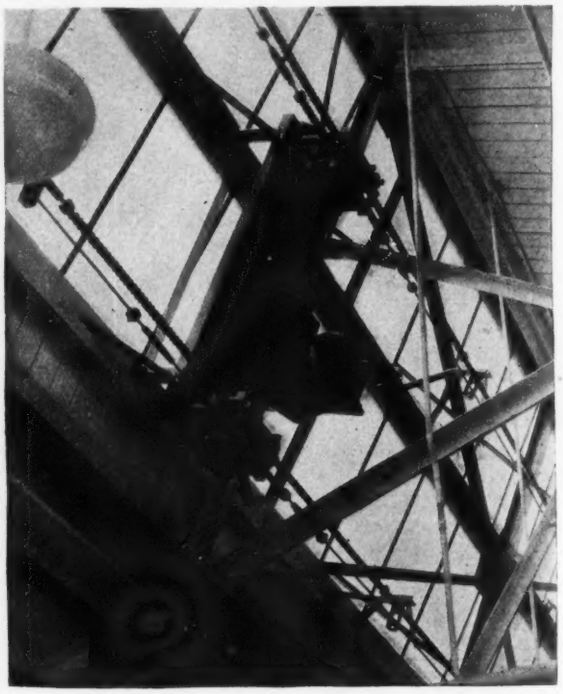
Motor-Operated Skylight Eliminates Manual Labor

VENTILATION can be controlled without manual effort by electrically operated skylights in the new tire factory of the Pacific Goodrich Rubber Company in Los Angeles. The buildings cover several acres, so that



Motor-driven gear and chain mechanism operates skylights by push-button control

a maximum of light can be admitted into the sawtooth skylights. Each main skylight is motor operated with gear and chain mechanism, as illustrated. Push-button control enables opening or closing the windows as desired.

Each of the geared devices is operated by a 1-hp. U. S. "AutoStart" motor, there being 36 such installations. Motor applications such as this illustrate the growing tendency in industrial plant layout toward the elimination of all possible manual operations that will reduce labor and speed production.

Conduit Sizes for Wires and Cables

Conduit Nom. Sizes		½ In.	¾ In.	1 In.	1¼ In.	1½ In.	2 In.	2½ In.	3 In.	3½ In.	4 In.
No. of Wires	Factor	Maximum Diameter of Wires or Cables in Conduit									
1	1.35	0.462	0.610	0.778	1.02	1.19	1.53	1.83	2.27	2.63	3.00
2	2.50	0.249	0.330	0.420	0.552	0.644	0.828	0.988	1.23	1.42	1.61
3	2.70	0.231	0.305	0.390	0.511	0.596	0.767	0.914	1.14	1.31	1.49
4	3.10	0.201	0.266	0.339	0.445	0.519	0.668	0.796	0.999	1.14	1.30
5	3.50	0.178	0.235	0.300	0.395	0.460	0.591	0.706	0.876	1.01	1.15
6	3.80	0.164	0.216	0.276	0.364	0.424	0.545	0.650	0.807	0.935	1.06
7	4.10	0.152	0.201	0.256	0.337	0.392	0.505	0.603	0.749	0.866	0.984
8	4.40	0.141	0.187	0.239	0.314	0.366	0.470	0.562	0.698	0.806	0.916
9	4.70	0.133	0.175	0.224	0.294	0.342	0.441	0.525	0.653	0.755	0.858
10	5.00	0.125	0.165	0.210	0.276	0.322	0.414	0.494	0.614	0.710	0.807
11	5.25	0.119	0.157	0.200	0.263	0.307	0.394	0.471	0.584	0.676	0.768
12	5.45	0.114	0.151	0.193	0.254	0.296	0.380	0.453	0.563	0.651	0.740
13	5.70	0.109	0.144	0.184	0.242	0.283	0.363	0.433	0.538	0.623	0.707
14	5.90	0.106	0.139	0.178	0.234	0.273	0.351	0.418	0.520	0.601	0.683
15	6.10	0.102	0.135	0.172	0.226	0.264	0.339	0.405	0.503	0.583	0.661
Conduit nom. sizes		½ in.	¾ in.	1 in.	1¼ in.	1½ in.	2 in.	2½ in.	3 in.	3½ in.	4 in.
Conduit inside dia.		0.623	0.824	1.05	1.38	1.61	2.07	2.47	3.07	3.55	4.03

DIRECTIONS

To find smallest conduit required for any number of wires, use horizontal column corresponding to that number, and the minimum conduit will be found at the head of the vertical column corresponding to the nearest larger diameter of a single wire.

Example: Conduit required for three cables, each having an outside diameter of 0.510 in., look in three wire column and find the diameter 0.511, calling for a 1½-in. conduit.

Use of Factors: The column of multiplying factors may be used for checking for any size wire or cable; thus, for three wires, the factor is 2.70; with a wire diameter of 0.510, the diameter of conduit required = 0.510x2.7 = 1.377 in. The nearest conduit size is 1½ in., with inside diameter of 1.38 in.

Suggests Method of Making

Water Heating Profitable

Study of load characteristics and "value of service" to user suggests practicable method of obtaining water heating load

By S. B. Hood
Development and Research Engineer, Oakland, Calif.

HEATING water electrically offers one of the cleanest cut forms of utilization of electrical energy in the home, and one which, properly applied, can be used to make residential service by far the most desirable and profitable of any class of business connected to the utility's lines.

Much has been said recently about the national average residential consumption of one lonely little kilowatt-hour per day per customer. Certainly such a record is far from commendable, especially since this average is largely made up of customers who seldom exceed their minimum bill. That the average is not less is due to a relatively few domestic users of energy who have become sold on the merits of electrical service for operation of the entire utility service in the home.

One must not lose sight of the fact that practically every home is operated by utility service, but the majority are not of the electrical type. Bearing this in mind, the prospective business exists today and does not have to be developed by a long-drawn-out educational program. All that is necessary is for the utility commercial engineer to sell his customers on the idea that what they are doing today with his service—plus that of the gas man, the ice man, etc.—can be done electrically better, safer and cheaper. However, we cannot expect the utility commercial engineer to sell something on which he is not sold himself.

The use of electric lighting in the home is almost universal and countless portable appliances, such as irons, toasters, portable heaters, etc., are of course widely used. Why stop here with business having a poor load factor which cannot be very much bettered? A fairly well-developed residential load composed of lighting and miscellaneous appliances will account for perhaps 50 kw.-hr. per month per customer, and after allowing for the diversity between monthly consumption an average return per annum of $25 per customer is fairly good business.

The electric range has long since passed the experimental stage and would find far wider usage today were it not for the fact that so many utilities still consider it a questionable form of load as to its profitability. In this there is ample ground for the belief where ranges are so widely distributed that but one or two are connected to each secondary bus section, frequently requiring enlarging of an existing bus and the installation of a larger transformer before the range can be satisfactorily operated. With any appreciable number of ranges connected to the system the diversity becomes such that a range having a connected load of 6 kw. will not integrate on the system at more than 1 kw. However, if the distribution is scattered this diversity does not extend to the local distribution transformer and secondary system, on which anywhere from $100 to $400 must in many cases be spent before the first range can be supplied. When the utility executive is called upon to approve expenditures of this value, on which the annual fixed charges eat up a large percentage of the gross revenue from the additional business, one cannot blame him for placing range business in the unprofitable class. It is only when a concentrated distribution of range installations is made that this business becomes desirable, even though the kilowatt-hour consumption may be triple that of the best development of the lighting load.

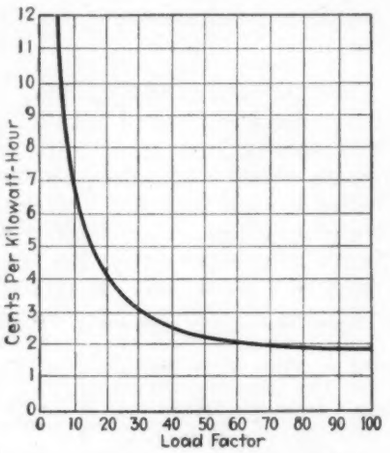
Such a development cannot be made unless the utility is prepared to offer a domestic hot water heating service, as the two go hand in hand. Few prospects can be induced to split their business and give the electric utility the range and the gas company the water heating. More than one utility has had this fact impressed upon it by having a 100 per cent range development in new residential districts slowly drop to the usual negligible percentage after the gas company had extended its mains into the district and had taken on the water heating load for those customers already having electric ranges and, incidentally, all the water heating load, plus most of the range load, of all additional customers as the subdivision reached a greater development. Had the utility been farsighted enough it could have held its initial 100 per cent

Every central-station company desirous of increasing its residence load will find that the following article contains much food for thought. In it Mr. Hood has made a critical analysis of some of the existing methods of serving the domestic electric water heating load and suggests a means of taking on this business at a profit to the utility. The significance of the possibilities of this load is seen in the following quotation from the article: "It is predicted that a complete electrified utility service can be rendered the moderate-sized home with an integrated peak demand not exceeding 2 kw., and with load factors of the order of 75 to 90 per cent. With intensified sales effort the present residential average consumption of 1 kw.-hr. per day could readily be increased to 1 kw.-hr. per hour within the next decade and the residential load become the backbone of the industry."—Editor.

saturation on ranges and also a 100 per cent saturation on water heaters, a piece of utilization equipment that would be good for three times the kilowatt-hour consumption of the range and nine times that of the lighting load.

An electric water heater is not a new piece of utilization equipment requiring initial development work or an extensive educational campaign to sell it to the customer. These devices are based on the simplest and most well known engineering laws and data and they have been in successful use for many years. An electric water heater is perhaps the only piece of utilization equipment which permits the storage of energy. With it every kilowatt-hour used means approximately 4 gal. of water heated to the proper temperature for domestic use. If suitable heat insulation is placed around the storage tank the losses from radiation become negligible.

The average family will use about 40 gal. of hot water per day, averaged month in and month out. To heat this there will be required about 10 kw.-hr. per day, or 300 per month. The result to the consumer will be identical whether the utility permits him to install a 5-kw. heater used an average of two hours per day or a 1-kw. unit used ten hours per day. In either case the return is limited to the "value of service," which in most localities cannot exceed about $4 per month. Any higher rate means that the business is handed to some other competitive fuel on a silver platter.



Cost curve of rate at which energy must be sold based on hypothetical utility

However, from the utility company's standpoint a water heater rate based on value of service—and it must be so based to get the business—without restrictions as to how the energy is to be utilized may mean to the company the difference between a receiver and an extra dividend. The accompanying cost curve showing the rate at which energy must be sold at different load factors will serve to illustrate this point. This is plotted for a hypothetical utility whose investment is $400 per kilowatt-hour, annual fixed charges 12 per cent per annum, customer's expense 50 cents per month and variable energy cost 1 cent per kilowatt-hour.

If the water heater customer uses a 5-kw. element he will operate on a load factor of between 8 and 9 per cent, and to break even on his business a company should get pretty close to 9 cents per kilowatt-hour. This is six times what it can get and hold the business. Now if the customer is limited to a 1-kw. unit and is required to use it ten hours per day he will have a load factor of 40 per cent, which on the curve means 2½ cents per kilowatt-hour. At this figure a company can perhaps get a little water heating business, but it is still too high to hope to get all the business, and when a company goes after a class of business it should be on the basis of ultimately all or none. It is here where the range and water heater should be classed as one unit, since both are of questionable profitability when segregated.

With a properly developed range and water heater load the range will integrate on the system at not more than 1 kw. The water heater must be so wired and controlled that it cannot come on the range peak. This statement is made most emphatically, since upon it depends absolutely the success or failure of a water heater service; that is, from the utility's standpoint. Most utilities which have attempted to take on the water heater load recognize this and have adopted the double-throw switch as the solution. Such a switch, manually operated, is but a partial success, since the customer must devote a considerable effort in order to get results comparable to that of a modern automatic thermal storage gas water heater. The automatic form of double throw in the form of a relay connected in series with the range circuit does, however, fulfill completely the requirements of peak control without forethought on the part of the consumer.

Desirable Rate Basis Established

With such control a 1-kw. water heater will not appreciably add to the integrated range peak, provided the tank storage capacity is equal to at least the average 24-hour consumption, and preferably 25 to 50 per cent greater than that average. With such an installation the integrated peak demand can be taken at 1 kw.-hr. and the monthly consumption of range and water heater at 450 kw.-hr. This is a combined load factor of 62 per cent and better than almost any other class of business obtainable. The curve shows that a 2-cent rate would carry this business for our hypothetical utility. To be within the value of service the range rate can be 3 cents and the water heater rate 1½ cents, making an average for the two of just 2 cents. A utility having cost figures close to those used could therefore get out and get this business against other competitive forms of utility service and, what is more, could hold it and earn a fair profit on every connection.

The popular water heater installation today is not the one recommended, but rather one that is being extensively used by a relatively few utilities whose peculiar load conditions favor a low rate and where load factor does not appear to be of very vital importance. The heater most used by them, and the one which a number of manufacturers are recommending for general adoption to the great detriment and loss of many utilities whose conditions it does not fit, has a 2.5 to 3-kw. unit and a thermal insulated tank of from 15 to 20 gal. capacity. Numerous test data indicate that with these there will be a diversity of about 2.5 to one, so that the heater load will integrate on the system at around 1 kw. Where the error seems to be made is that this 1 kw. does not take its supply from the diversity of a 1-kw. integrated range load, but rather becomes cumulative with it. In other words, the integrated system load will be about 2 kw. Our hypothetical utility would therefore have to get 3 cents for the energy, since the load factor would be but 31 per cent. With a "value of service" limitation of 2 cents the utility would face a 33⅓ per cent theoretical loss on every one of these high-demand water heater installations it put on its lines.

During the past year the writer was connected with an extensive series of tests on a number of makes of water heaters in actual service. In connection with these tests several existing standard 30-gal. tanks were fitted with immersion units and the tanks covered with various thicknesses of insulation. While these resulted in the collection of much valuable data, it was found undesirable to

Industrial Futures

RESEARCHERS are industrial explorers who are pushing back the borders of the unknown.

Research is accelerated experience and the universal tool of industry.

It forecasts industrial futures and is the technical battering ram which undermines the foundations of business competition.

It is an X-ray that searches beyond industrial frontiers.

Progress is the result of organized industrial exploration and not the fruit of individual attic inventors.

Co-ordinated research permits simultaneous attacks of problems from different angles so the results can be combined.

What value are financial balance sheets, business barometers, etc., alone, if research can kick over the present order? The day will come when all bankers will demand data that can be secured only through research before making loans.

Old industries have been slowest to adopt research methods because of prejudice and have consequently not progressed rapidly. Whereas newer industries have darted ahead and attained outstanding positions because they substituted *revolution by research for evolution by experience.*

The time lag between abstract scientific research and mass production of the applied discoveries is a measure of the effectiveness of research facilities.

Thirty thousand researchers are busy today in 1,000 laboratories and spending $500,000 a day.

—Excerpts from address by Maurice Holland, director of engineering and industrial research of the National Research Council.

recommend the use of existing tanks. Most of these are installed close to the house-heating plant, in which firebox coils are placed with the idea of obtaining hot water during the heating season from the furnace. This practice is not giving satisfaction owing to inability to proportion the coil to suit firing conditions during both mild and severe weather. In addition, these firebox coils quickly clog with scale and then burn out, extinguishing the fire at the most inopportune time. Such installations cannot successfully be fitted with electrical heating units, as covering the tank with the proper thickness of insulation to minimize radiation losses will result in boiling the water when the house-heating plant is in use. During the non-heating season these firebox coils will circulate water from the tank and thus nullify to a considerable extent the thermal insulation on the tank. Finally, the location of the tank near the heating plant usually means a location to a considerable distance away from the principal hot water riser. The necessity of filling this length of piping with hot water and allowing it to cool after each use of a faucet introduces losses in excess of those through radiation from the insulated tank proper. Where there is an existing tank this should be allowed to remain and the new self-contained electrical water heater inserted in the existing hot water line as close as practicable to the main riser. In this way the original tank serves as a tempering tank, in which the incoming cold water supply will be raised to approximately basement temperature before entering the electric heater. An increase in efficiency of as much as 10 per cent will, during certain seasons of the year, follow the use of such a tempering tank.

The study that has been made in building up residential loads on a controlled peak basis indicates that off-peak control of water heating is but the first step toward what can be done along such lines. In the milder climates, where electric space heating is practicable, heaters of the thermal storage type can be developed and controlled readily by progressive peak-limiting relays. The electric range of today can also be modified to use thermal storage to some extent.

Contracting Rural Extensions Reduces Utility's Costs

Wiring contractors are anxious to do work and form good-will agents for power company in Pacific Coast territory

EXCELLENT results in rural-line extensions have been obtained by some power companies in the Northwest through contracting construction to independent wiremen. These lines are standard in every respect and meet with the requirements the utility specifies for its own work. Costs are cut about 25 per cent, which is sufficient reduction to enable the company to obtain desirable business which has been prohibitive in the past. Several districts served by the utility are more than 20 miles from its offices and storehouses and the time for labor, cartage and similar items is a large factor. Usually there are a number of independent contractors residing in these neighborhoods who are qualified to do standard line work. The companies have encouraged them in an experimental way until they not only build the line but frequently plan the extension, work up the business and practically complete the preliminary work without expense to the company.

Requests for extensions usually come through the regular commercial department channels. The sales manager passes on the merits of the extension and the proposal is estimated as though the company were doing the work and proper cost sheets prepared. The contractor submits his bid on the same class and amount of work. If customer payments are to be made, collections are made by a representative of the utility. Rights-of-way, highway permits, surveys and franchise rights are handled by the company. The contractor supplies all labor and material with the exception of transformers and meters. These are supplied by the company at its storeroom and installed by the contractor. The utility reserves the right to cut the line in, which is done after rigid inspection.

It is found that contractors desire all of this work

that they can handle. They act in dual capacity of foreman and lineman and hire craftsmen to assist at going wages. They put in full time on the job and eliminate lost traveling time. Customers frequently supply poles or contractors can get them in small lots in the neighborhood and have them laid down at the hole for approximately one-half the cost involved were the power companies doing the work. Customers donate labor and frequently dig holes, supply a team, clear rights-of-way, or care for the cartage. They are happy to do this if service is to extend to their church or school. Farm laborers will contract hole digging at 50 cents a hole. The item of stores expense and overhead is eliminated.

Wiring contractors are known, by reputation at least, in their communities and have the confidence of the customers, which would require numerous calls from a company representative to build up. A contractor usually obtains all the house-wiring jobs on the route of the extension, sells pumps and appliances, has a radio agency and other side lines that pay a profit. He lumps all his profit and can profitably make the final concession to sell the extension to the last two or three prospective customers that so often hold up a job.

Meanwhile the utility is relieved of all complaints incident to delay; rights-of-way and tree trimming privileges are quickly obtained, and there is no aftermath of damages for the utility. The line becomes a community and co-operative undertaking. Contractors protect the company from personal injury and property damage by bond approved by the power company.

The contractor becomes an unpaid good-will agent in his community and cares for complaints on his own time and at his own expense, or refers them to the proper departments of the company. He is an outpost for the trouble dispatcher in case of emergencies.

So successful has been this innovation that during the first six months of 1928 a number of extensions have been constructed by contractors, affording service to 200 new rural customers in one district.

Urges Mechanization of Office Routine

ADOPTION of machine methods has been very slow in the office, still prosperity of the country has hinged on utilization of machines, so it behooves accounting departments to give them serious consideration, according to W. B. S. Winans, Henry L. Doherty & Company. Even if an office can get only an even break from adopting machines, he considers it advisable to adopt them, as they release men from mechanical tasks for head work and avoid the overtime bugaboo.

Various examples of economies possible have been reported by him. Stock-transfer machines are saving three operations, 2,700 dividend checks are being addressed and recorded per hour with one machine, twenty simultaneous check signatures are being made with one pen, 12,000 envelopes are being sealed and addressed per hour with one machine and 20,000 envelopes are being opened per hour. Air-fed billing machines, sorting and tabulating devices, bill receipting and coupon cutters, lithographing, cranes, tiering machines, tractors, conveyors, lift trucks for storerooms, etc., are typical of other mechanical conveniences in the office.

Offices should constitute modern workshops, not only for economy but to educate customers on the use of electrical devices, Mr. Winans declares.

Letters from Our Readers

Bootleg Outlets

To the Editor of the ELECTRICAL WORLD:

The overzealous agitation to prohibit the manufacture and sale of the so-called multi-outlet attachment plug and to enforce strictly the lamp cord rule remind one somewhat of prohibition enforcement. These outlets appeared on the market because there was a demand for them, and they were welcomed by the public. If they were to disappear today the public would do what it did before, splice the cords. There is no denying the fact that the excessive use of loose lamp cords in home and office is a great nuisance which cries out loud for serious study. But it seems that the problem has been tackled from the wrong angle.

There is hardly a home in which the lamp cord rule is not being violated, and it would be comparatively safe to wager that it is being violated in the homes of those who are the loudest advocates of strict enforcement. If a feminine member of such a household desires to move a bridge lamp one foot further from the base outlet than the lamp cord rule permits, it is not reasonable to assume that the strict enforcement advocate would immediately call for a contractor to come over with his coil of BX and forthwith install a new outlet.

It is more reasonable to assume that he would proceed to the closet and moonshine an extension. The lamp cord rule should be modified to allow for longer extensions, particularly so since there is no mathematical proof that a cord of a certain length is safe and one which is one inch longer is dangerous. Connecting more than one device to a single base outlet will also very likely be common practice in homes for a good long time to come, all rules to the contrary notwithstanding. The question of whether or not this practice is really dangerous should be carefully studied in an atmosphere uninfluenced by the natural desire of contractors to have more outlets.

Architects should certainly provide more outlets than they are doing today, but no matter how many outlets they provide, long cords will still be used by the ladies of the house, when furniture is moved around or bridge tables or tea tables are placed in more convenient locations. And we can honestly and truly say that they are dangerous, that they cause fires and other accidents? Have we real statistics to prove it? If we haven't we should collect them.

Why not concentrate on the fuse, the size of which can and should be controlled. Why permit the use of 30-amp. fuses on branch circuits and then raise a howl about multi-unit receptacles and long cords? The fuse is the best and only protection against overload, so why not find some way of enforcing the correct fuse size. Furthermore, insist on plugs in which the cord can be clamped, thus preventing broken wires, instead of making a criminal out of every charming lady who desires to move the bridge lamp one foot further than the lamp cord rule will permit.

The real problem is to find means, within practical limits of safety, to encourage the use of more household appliances, rather than to look for means to limit their use.

M. M. SAMUELS.

New York City.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

The Corrosion of Condenser Tubes by Impingement.—R. MAY.—A previous report of the research committee of the Institute of Metals indicated that impingement attack, like other forms of condenser tube corrosion, is closely connected with the formation and breakdown of the more or less protective films which form on the surface of the tubes. A study of the behavior of the naturally forming films on the surface of the various tube alloys was undertaken to secure useful information regarding the suitability of the alloys for resisting impingement attack. A number of tests have been carried out to investigate the effect involved and certain suggestions offered to lessen the tube deterioration. It is stated that the most obvious thing to do in order to minimize impingement attack in condensers is to arrange the water passages to prevent as far as possible all rotating motion to the water in the inlet water box and inlet piping. At present it is not known to what extent this ideal is practicable but a tendency in modern design indicates the acceptance of the principle. In conclusion it is stated that impingement attack is not the only type of condenser tube corrosion, although it is possibly the most important. Often a tendency for the occurrence of other types of corrosion may coexist with actual impingement and in this respect condensers and condenser tubes show great differences. In recommending tubes for use in any particular condenser it is well, according to the author, to consider carefully any such tendencies, because at present no single tube is known which is equally resistant to all types of corrosive action.—*Engineering (England)*, Sept. 7, 1928.

Transmission, Substations and Distribution

Transmission System and Conductor Comparisons.—WILLIAM T. TAYLOR.—It is the contention of the author that overhead electric power lines are neither being used nor being designed in the correct manner. While practically every country has adopted almost exclusively the use of the three-phase system and while it is assumed to be evident that there is no better system available at the present time for the requirements of service, etc., it is stated that all possible insulations should be retained and the neutral should be made use of for increasing the protective value of the system, all kinds of external pressure rises, etc., for increasing the kilovolt-ampere capacity of transmission in terms of equal voltage stress to earth, for increasing the operating value and for permitting a more reliable line should a line conductor or a transformer phase unit fail. A transmission line and system should provide for equal transmission distance and equal stress on insulation, the highest possible kilovolt-ampere capacity, greatest inherent protective value and maximum reliability for normal as well as abnormal conditions, according to the contention of the author. An analysis of the various factors involved has been presented in connection with the considerations previously mentioned.—*Electrician (England)*, Sept. 7, 1928.

A Critical Study of the Current Rating of Low-Pressure, Ordinary-Duty Fusible Cutouts.—P. D. MORGAN.—There are, according to the author, two distinct methods of rating used in Great Britain for ordinary-duty fusible cutouts. The first is based upon an absolute value of minimum blowing current and is difficult to determine. The second adopts the one-minute blowing current as the basis. While the former method is generally admitted to be unsatisfactory from a practical standpoint, the latter method is shown to be unsuitable for semi-inclosed cutouts employing tinned copper fuse links. The present report reviews British, Continental and American practice, deduces a method of rating suitable for existing British designs and provides the experimental data required for a revised specification. The problem confronting a designer calibrating a range of cut-outs to comply with the revised basis are dealt with in detail, together with simple tests by which the user may check the rating in practice.—*Journal of the Institution of Electrical Engineers (England)*, September, 1928.

Analytical Notes on the Economics of Power-Factor Correction.—GEORGE F. MARSTELLER.—The discussion deals entirely with the economic aspect of power-factor correction and transmission systems. It is not intended to bear on the subjects of voltage regulation or stability, nor is it concerned with the problem of power-factor improvement in electrical machinery. The losses in a transmission line supplying power to a load having a power factor less than unity can be reduced by power-factor correction at the receiving end, the most economical system being that in which the saving in transmission-line losses, due to power-factor correction, shows the greatest margin over the total annual cost of the plant installed to provide that correction, according to the contention of the author. General expressions which give for any particular case, on inserting relevant practical figures for various constants and basic costs, the most economical degree of power-factor correction and hence the best rating of synchronous or other condenser equipment are given.—*Journal of the Institution of Electrical Engineers (England)*, September, 1928.

Generation, Control, Switching and Protection

The Bridge River Power Plant.—FREDERICK H. FULLERTON.—The development of the Bridge River in British Columbia by the British Columbia Electric Railway Company involves as its first step the addition of 60,000 hp. hydro-electric power to the system of that company before 1930 and another 30,000 hp. by 1933. The Bridge River power project possesses two features of special interest which distinguished it from other power developments in Canada. These are, first, the large amount of water available for diversion and, secondly, the high head which may be utilized. The river in question has a drop of 1,400 ft. within a few miles. Topographical conditions permit the ready use of the potential energy involved in the flow of the water, largely due to the winding character of the stream. An ultimate development of 600,000 hp. is contemplated. A description of the several power plants to be erected in connection with this project is included in this discussion.—*Electrical Review (England)*, Sept. 28, 1928.

Units, Measurements and Instruments

Absolute Methods in Reflectometry.—H. J. MCNICHOLAS.—The theory and use of the integrating sphere in the three methods of reflectometry commonly recognized are discussed in connection with a new absolute method involving no direct use of an integrating device. The new method is based upon a general law of reciprocity, first stated by Helmholtz, by means of which certain reciprocal relations between the reflective properties for unidirectional and diffused illumination are derived and applied. Under completely diffused illumination the brightness of a sample in general increases with increasing angle of observation from the normal to its surface. The illumination on the sample being known, these brightness data are shown to yield the reflectance of the sample for any manner of illumination ranging from unidirectional to completely diffused. Equipment is described for the measurement of reflective properties of materials under either completely diffused or unidirectional illumination for various directions of observation.—*Bureau of Standards Journal of Research*, July, 1928.

On the Computation of Induced Voltage in a Communication Line Caused by Occasional Grounding of Neighboring Power Line.—K. KANAYA.—A convenient chart has been introduced by the author by means of which the voltages induced electromagnetically in a communication line and caused by an acci-

dental grounding of a neighboring power line may be considered theoretically. This chart has been derived from a mathematical treatment with the consideration of an equivalent earth plane as a basis and simply shows the relation between the voltage induced per unit length per ampere of inducing current as affected by a factor representing the mean separation of both circuits.—*Journal of the Institute of Electrical Engineers of Japan*, August, 1928.

Illumination

Some Problems of Inter-Reflection.—H. BUCKLEY.—The problem of the multiple reflection or inter-reflection of radiation from the boundaries of an inclosure is considered and the fundamental integral equation of the problem obtained. The questions treated in this discussion are those concerned with the effect of inter-reflections in the production of "black-body" radiation in a number of partially inclosed, uniformly heated, constant temperature inclosures. For each of these there is a similar inverse problem in which the inclosure is non-radiating, but is illuminated by a uniform sky surrounding the inclosure. The former problems are of interest in giving information respecting the approximation of the "ideal black-body conditions" which may be obtained by means of inclosures which are not completely inclosed, while the latter bear some resemblance to the problems of interior lighting by means of daylight.—*Report International Illumination Congress*, September, 1928.

Study of the Distribution of Flux from Lighting Devices.—J. WETZEL.—A plan for assessing the performance of an illumination fixture from the point of view of the uniformity of illumination attainable by its use has been offered by the author under the name of the "method of uniformity curves." In the case of street lighting it is assumed that the fittings are situated in a straight line. The author gives a definition of the coefficient of uniformity which takes cognizance not only of the extreme values of illumination, but also of the intermediate values. The coefficient thus defined is a function of the spacing-height ratio of the units. It is this function which is represented by the uniformity curve.—*Report International Illumination Congress*, September, 1928.

Electrophysics, Electrochemistry and Batteries

Porosity of Electrodeposited Chromium.—E. M. BAKER and A. M. RENTE.—A study of the porosity of chromium deposited from chromic-acid chromium plating baths. In this investigation the findings of previous workers have been confirmed and extended and certain conclusions drawn regarding the thickness of deposit necessary to give minimum porosity in conjunction with bath temperatures, concentration, etc. The liberation of hydrogen gas which is so characteristic of chromium plating processes is credited by the authors as constituting one of the potential sources of high porosity in these deposits.—*Report American Electrochemical Society*, September, 1928.

Large Electromagnet.—A. COTTON.—For the study of the influence of strong magnetic fields upon certain substances, light waves and other physical phenomena strong electromagnets have been built in the past. To obtain the desired high magnetic density, all of the existing magnets have an air gap of only a few millimeters. To allow research of this nature without being restricted to a slot gap of some one-quarter inch, the French Academy of Sciences has devoted a sum of 1,000,000 francs to build an electromagnet which by far exceeds in size anything of the kind in existence. The dimensions of this magnet are 20 ft. length, 9 ft. height and 9 ft. width, weighing complete 120 tons. Setting the pole pieces to one inch distance, a density of 45,000 gauss or about 280,000 kilo-lines per square inch can be obtained. The two coils of the magnet are wound with a square copper conductor, having a circular hole, through which water is made to flow. There are a total of 1,250 turns, which, at the rated current of 400 amp., makes available 500,000 ampere turns. Two electric motors are provided to set the poles at any desired distance from each other. The active iron and copper weigh 105 and 9 tons, respectively. The full excitation of the magnet requires 96 kw. (400 amp. at 240 volts d.c.).—*Révue Générale de l'Electricité*, Sept. 1, 1928.

Traction

The Preliminary Heating of Electric Trains.—W. LÜTHI.—The application of a transformer bank mounted upon a flat car to the problem of securing heated cars at railway terminals without the necessity of an early reporting hour by train crews or workmen has been covered in this article. The automatic devices utilized with this equipment have been considered both for large and for small installations. The operation of this equipment is almost entirely automatic and depends upon such factors of load and temperature as may be involved.—*Brown Boveri Review*, September, 1928.

New System of Train Lighting.—L. DREYFUSS.—The principal element of this system is an axle-driven generator, the field of which is regulated by, and is in series with, a special regulating motor. The field of the latter is excited by a small auxiliary battery, while the main lighting battery floats across the armature of the generator. The characteristics of the small regulating motor are such as to buck or boost the generator voltage in exact proportion to its speed and voltage variations. A centrifugal switch on the regulator and an automatic current and selector switch on a panel comprise the essential parts of the equipment. The charging current of main and auxiliary batteries can be set to a definite value, which is automatically maintained. It is claimed that the ruggedness, simplicity and reliability of this new train lighting system surpass any other existing method.—*Elektrotechnik und Maschinenbau*, Sept. 9, 1928.

Telegraphy, Telephony, Radio and Signals

The Nature of the Field in the Neighborhood of an Antenna.—RAYMOND M. WILMOTTE.—The problem dealt with is the calculation of the effective electromotive force induced in a receiving antenna from the field of a neighboring transmitting antenna. It is assumed that the distribution of the current in the transmitting antenna is known. In this connection, the author has shown that with the simple antenna, usually met with in practice, the current distribution can be readily calculated. In concluding the discussion, the problem of interference is considered. It is suggested that a criterion for the interference of radio stations presented on the current and potential spectrum at the foot of the antenna should be continued. A new spectrum calculated from these would give the variation of the sum of the squares of the current and potential, with frequency, for the harmonics and average working modulation of the station. From a rough calculation, the maximum energy of radiation for a unit current at the various frequencies of the spectrum could be calculated and, possibly, combined in some suitable arbitrary way with the maximum energy of radiation along the ground. The product of this arbitrary relation and the spectrum distribution, obtained as explained, would form a convenient basis of a criterion for the measurement of interference.—*Journal of the Institution of Electrical Engineers (England)*, September, 1928.

Miscellaneous

The Cleaning of Coal.—The cleaning of coal by the process of froth flotation is outlined and the advantages of such a cleaning procedure pointed out. In this process coal is cleaned by mixing with about four times its weight of water and introducing minute air bubbles. The air bubbles attach themselves readily to particles of bright coal, which accordingly float, but do not attach themselves to particles of shale, which therefore sink. Thus bright coal and shaly substances in an aqueous mixture can be separated by producing in the mixture a sufficient number of small air bubbles. The volume of these, the authors state, must be at least 260 liters to float a ton of bright coal particles of a specific gravity of 1.35. Air must be introduced into the mixture by suitable means and to promote the formation of bubbles, the properties of the water must be modified by the addition of certain soluble substances such as cresol, which diminish the surface tension of the water.—*World Power (England)*, October, 1928.

News of the Industry

Electric Bond & Share Maintains Stand

Persists in Refusal to Testify Before Federal Trade Commission, and Its Right to Do So Now Goes to Courts—Publicity in Washington and Kentucky

By Paul Wooton
Washington Correspondent for the Electrical World

IN CONFORMITY with the legal stand taken last week, members of the staff of the Electric Bond & Share Company refused to testify at the session of the Federal Trade Commission Tuesday, Oct. 23, concerning the business affairs of the company. It was stated on behalf of the company that there had been no disbursements to influence or control the election of federal officers, and those who had searched the company records for such payments were present to testify to that effect.

The procedure on Tuesday was largely to provide the formalities necessary to the test in the courts of the extent of the commission's powers. It is thought to have been that purpose which prompted Judge Robert E. Healy, the commission's chief counsel, to ask concerning an alleged payment of $359,000 to S. Z. Mitchell, the chairman of the board of directors of the Electric Bond & Share Company. This provides for the record a request for specific information. Judge Healy, however, did not allege that the sum had been paid to Mr. Mitchell as a bonus, as was stated in dispatches to certain newspapers. He did sound the warning, however, that refusal to explain would be subject to misinterpretation. There was no indication in Judge Healy's questions that the sum may not have been used to provide for items which could not be foreseen in the company's budget.

Expected Legal Procedure

The commission is expected to follow its former procedure in the handling of this case. The next step will be to request the Attorney-General of the United States to institute a mandamus proceeding. This motion is usually brought in the federal district of which the witness concerned is a resident. From the district court the case is carried directly to the Supreme Court of the United States.

To date there has been no announcement from the commission as to whether or not it will await the action of the court in this case before attempting to obtain similar information from other companies, and likewise there has been no indication as to whether or not other companies will pursue the same course as has the Electric Bond & Share Company. It is known that the examiners have not advanced as far with their work in other offices as they had in that of the Bond & Share company. For this reason some weeks may elapse before there will be occasion to test that point.

When R. B. Feagin, vice-president in charge of public relations, who was questioned in the preceding session, was once more brought to the stand, J. F. MacLane, the company's counsel, succeeded in making a statement on its behalf, despite the efforts of Commissioner McCulloch to stop him. Mr. MacLane's statement follows:

"The Electric Bond & Share Company has made no disbursements to influence or control elections of President, Vice-President or members of the United States Senate and therefore has no vouchers or records with respect thereto. Witnesses who have searched the records are available here to verify this statement. As to any other matters we must respectfully decline to submit witnesses for examination or to produce records or papers until the fundamental constitutional and legal questions presented at the hearing on Oct. 17 have been adjudicated. We stand ready to lend every assistance in bringing about a speedy adjudication of the questions involved."

The officers and employees of the company were asked with reference to expenditures to influence opinion as to public ownership or operation of the means whereby electricity is generated or distributed, the growth and capital assets of the Electric Bond & Share Company, whether officers in subsidiary companies hold Electric Bond & Share stock, and whether bonuses had been given to company officials in connection with stock issues of subsidiary or connected organizations. Although directed to answer, the witnesses declined. Judge McCulloch informed each one that he would be required to comply with the commission's requests.

Since they refused to answer the principal questions asked, questioning of witnesses brought out little that was new, but it did indicate what facts the commission's attorney was trying to bring out.

Comptroller Smith was called to explain why he did not bring vouchers as directed. He said that his reason was advice of counsel and that the element of time in gathering the required information was not a factor. He also was asked concerning the payment of $359,000 to Mr. Mitchell. The testimony shed no light on this subject because of refusals to discuss the matter. In examining Mr. Feagin, Judge Healy also tried to ascertain who had received a commission on the sale of preferred stock amounting to about $350,000.

More Publicity Testimony

On Oct. 24 Mrs. Josephine Corliss Preston, Superintendent of Public Instruction in the State of Washington and former president of the National Educational Society, voluntarily appeared to explain her part in activities in connection with which her name had been mentioned in previous hearings. She was introduced by Representative Albert Johnson of Washington. Mrs. Preston maintained that her help to Mrs. C. K. Tripp and to the Northwestern Light and Power Association in sanctioning the distribution of utility monographs through the schools and permitting a prize essay contest on the subject of state regulation of public utilities was entirely consistent with her past work. For many years she has been active in promoting vocational education with the idea that if teaching were confined to the academic branches, thousands of pupils would drop out of school to earn a livelihood. In furthering vocational training, Mrs. Preston said, she thought it necessary to make industrial information available in the schools. As to the introduction of propaganda material into textbooks, she cited the state laws which put the selection of these books into the hands of various boards over which she had no control. Mrs. Preston's term as superintendent ends this year. It is understood that unfavorable comment due to misunderstanding of her relations with utility organizations was largely responsible for her failure to be renominated in the Republican party primaries.

Robert Montgomery, sales manager of the Louisville (Ky.) Gas & Electric Company, testified concerning a letter he had written to G. F. Oxley, publicity director of the N.E.L.A., introduced as evidence last April. It developed that Mr. Oxley had been trying to interest utility companies in establishing a public information bureau in Kentucky similar to those in other states. Mr. Montgomery did not think this would be worth the cost involved and tried to show in his letter that the Louisville company was doing something just as good if not better in maintaining friendly press relations. The letter spoke of keeping "the editorial departments informed" as to items of interest in the electrical industry. This and similar statements the witness admitted to be unfounded, although he said he frequently gave information to reporters.

Congressional Medal Is Given to Edison

Secretary Mellon the Spokesman at West Orange Ceremony After Tribute by President Coolidge Is Broadcast—Inventor Replies

NEARLY one hundred persons, including leaders in the electrical industry, Edison Pioneers and men prominent in other walks of life, assembled in the laboratories of Thomas A. Edison at West Orange, N. J., on Saturday evening, Oct. 20, to see the presentation to the inventor of the medal voted him by Congress for his achievements. Standing in his workroom, surrounded by his distinguished visitors, Mr. Edison first heard the tribute by President Coolidge that was broadcast from Washington. Addressing his great invisible audience as "fellow-countrymen," the President touched briefly on Edison's characteristics and on a few incidents in his career. He concluded:

Although Edison belongs to the world, the United States takes pride in the thought that his rise from humble beginnings and his unceasing struggle to overcome the obstacles on the road to success well illustrate the spirit of our country. We are happy to share his achievements as our contribution to progress. He represents the finest traditions of our citizenship. Not only by his own discoveries, but by training in his laboratories men who have gone out to important places in the scientific and industrial world and by encouraging countless others to renewed efforts in applied science and invention, he has made a notable contribution to education. This is my message to Mr. Edison:

"Noble, kindly servant of the United States and benefactor of mankind, may you long be spared to continue your work and to inspire those who will carry forward your torch."

Secretary Mellon read a brief summary of the inventor's career and praised the personal qualities that had made it possible. "In the space of a single lifetime," said Mr. Mellon, "he has changed the conditions under which men live and, more than any one else now living, has helped to bring about a new social order based upon the achievements of modern science."

Mr. Edison, speaking into the microphone, then said:

Mr. President, Mr. Secretary and honored guests: In accepting the medal which has been awarded to me I do so with a keen appreciation of the great honor that has been conferred upon me. To my mind there is a profound significance in this token of the esteem and good will of my fellow-countrymen as expressed by their representatives in Congress. This medal will be a source of pride and veneration to my family as well as to myself and will be preserved in my home with my choicest possessions. Thank you.

After the medal had been bestowed Ronald Ian Campbell, Chargé d'Affaires of the British Embassy, acting for Sir Esme Howard, the British Ambassador, who is abroad, returned to Mr. Edison the first phonograph he made. This instrument was lent by Mr. Edison to the South Kensington Museum in London 39 years ago. The inventor thanked Mr. Campbell and said that the instrument recalled memories of long ago. The original electric lamp, invented 49 years ago, remains in the museum as the gift of Mr. Edison.

The last speaker was Dr. John Grier Hibben, president of Princeton University, who stressed the inventor's many contributions to industry and science.

Rates in New Bedford

In Effort to Help City's Recovery from Textile Strike Local Central Station Effects Yearly Saving of $135,000 to 44,000 Customers

PRESIDENT OLIVER PRESCOTT of the New Bedford (Mass.) Gas & Edison Light Company has announced four rate reductions effective Dec. 1, particularly to assist in the recovery of the city from the effects of the recent protracted textile strike. This is the third voluntary reduction in rates made by this company in the past 30 months, and it is computed that the new rates will save the forty-four thousand customers of the company $135,000 annually. The new rates are all optional and apply to residential lighting, combined residential lighting and domestic service, and commercial electric lighting in all zones, and to the general power rate.

An excess energy charge of 2.5 cents per kilowatt-hour is a feature of the combined rate for residential service in the first zone after a demand charge of $1.80 per month and a rate of 4.5 cents for each of the first 50 kw.-hr. The previous rate of 8 cents for the first 1,000 kw.-hr. per month used in the first zone continues available, as does the former domestic cooking, heating and refrigeration rate (on separate meter) of 10 cents per kilowatt-hour plus 3 cents for excess in the first zone. The former rates of 11, 13 and 14 cents for the second and third zones remain. About 35,000 residential customers are on the books. The single meter rate is standardized for domestic service and is believed to be one of the lowest promotional rates in the East.

The new commercial lighting rates are based on use of demand and result in lower price to customers, particularly for demands of 2 kw. and over and a usage of over 120 hours. The general power rate has been reduced for usages of 100 kw.-hr. to 2,000 kw.-hr.

Open Meeting on Grounding and Wiring to Be Held

An open code conference under the auspices of the electrical committee of the National Fire Protection Association has been called for 12:30 p.m. Nov. 15 in the auditorium of the Consolidated Gas Building, New York City, to consider grounding requirements, grounding methods and allowable forms of wiring. A. R. Small of the Underwriters' Laboratories will preside.

Water-Power Jurisdiction Is Argued at Ottawa

Dominion and Provincial Governments Join Issue Before Canadian Supreme Court—Case Likely to Be Appealed to the Privy Council in England

ARGUMENT in the water-power jurisdiction case before the Supreme Court of Canada was concluded at Ottawa on Monday, Oct. 15, after a hearing which lasted for more than two weeks. It was a battle between the Dominion and the provinces over rights to water powers on navigable streams. Decision in the case was reserved, but it is altogether likely that as soon as judgment is rendered the case will be appealed to the Privy Council in England.

In all, ten specific questions were submitted to the court, but the principal contention of the Dominion government was that the power of Parliament to regulate and control navigation and navigable water could not depend upon the consent of a province. On the other hand, counsel for the provinces contended that the water powers and authority over them belonged to the provinces before confederation, and that nothing in the British North America act had the effect of transferring to the Dominion such ownership.

An interesting point was touched on by W. N. Tilley, counsel for the Province of Ontario, when he declared that the Dominion Parliament had not the legislative jurisdiction to ratify any possible treaty negotiated with the United States for deepening the St. Lawrence River and incidentally developing water power; that the only seat of such jurisdiction was the Imperial Parliament.

Hydro Permit for the Royal Gorge Denied in Colorado

A unanimous refusal to permit the Public Service Company of Colorado to build a hydro-electric plant in the famous Royal Gorge of the Arkansas River near Canon City, Colo., was given on Oct. 20 by the Public Utilities Commission of that state. The commission held that the plant could not be built without marring the scenery, that there was no sufficient economic reason for erecting it, and that the accrual of public benefit through lower rates for energy was problematic.

Engineers for the company insisted that the plant could be erected without marring the beauty of the gorge or drying the channel, but in this they were disputed by engineers for opposing railroads and by many civic and commercial associations. The company said at the outset that it had no desire to fight the case if there was strong opposition. Such opposition having arisen from every nook of the state, it is thought likely that the commission's action will end the matter.

No Government in Business, Hoover Says

Accuses Opponents of Favoring State Socialism—Any Federal Production of Power Must Be Byproduct, He Insists—Smith Makes Rejoinder

AMONG the political utterances with which the air is filled those of this week of most direct interest to the utility industry have been the speech of Herbert Hoover, Republican candidate for the Presidency, in New York City on Monday night, and Governor Smith's answer on Wednesday. Mr. Hoover's text was government in business, and he reiterated his well-known views against putting it there. He accused his opponents of favoring state socialism on three counts, declared that any production of power by the federal government must be as a byproduct only, and said that regulation could prevent destruction of opportunity by great business units. Space limitations make it impossible to reprint much of his speech, which has had nation-wide newspaper circulation. The extracts in the accompanying panel show its gist.

GOVERNOR SMITH STRIKES BACK

Governor Smith made a vigorous rejoinder to Mr. Hoover at Boston on Wednesday night, declaring that "socialism" is the stock charge made against progressives in politics and that if it is correctly applied to him because of his water-power policies, then the late President Roosevelt, Charles E. Hughes, former Governor Miller of New York, Owen D. Young and many other leaders come in the same category. The Governor reiterated his attack on Mr. Hoover's Muscle Shoals utterances (this attack was summarized in last week's ELECTRICAL WORLD) and referred to the circularization by the National Electric Light Association of Mr. Hoover's 1925 speech before its convention at Atlantic City as spreading propaganda against public ownership. Among other things he said:

I knew all along exactly where the Republican candidate stood, but I have been talking water power for the purpose of bringing him out into the open and it took from Aug. 11 until Oct. 22 to do it. And on last Monday night in Madison Square Garden he let the cat out of the bag when he declared that the Democratic theory of public ownership and public development was state socialism. Well, how about the members of Congress that voted for the development of Muscle Shoals by the government? In a few minutes in the city of New York in Madison Square Garden their party allegiance was automatically transferred for them by the candidate from the party of their adoption to the Socialist party. . . .

I have stated my position, and let the Republican candidate make good that promise that he made on the eleventh of August to use words to convey his meaning. Now, if he did that, this is what he would have to say: "I believe in either selling or leasing over a term of years for private development and for private profits the great water powers that belong to the people all over the country." . . .

Now, there is a very wide difference between the public ownership and the public control of water-power sites, which in the first instance belong to the people themselves, and the operation and ownership of a going business [the railroads].

Senator Norris Comes Out for Governor Smith

Basing his change of political allegiance on the farm-relief and water-power policies of Governor Smith as contrasted with those of Secretary Hoover, Senator George W. Norris of Nebraska, leader of the Republican Progressives in the Upper Chamber and consistent fighter for government ownership and operation of the Muscle Shoals plants, declared at Portland, Ore., on Wednesday that he would work for Governor Smith's election and would announce this stand in a public broadcast address at Omaha on Saturday evening.

Mr. Hoover Says:

There has been revived in this campaign a series of proposals which, if adopted, would be a long step toward the abandonment of our American system and a surrender to the destructive operation of governmental conduct of commercial business. Because the country is faced with difficulty and doubt over certain national problems—that is, prohibition, farm relief and electrical power—our opponents propose that we must thrust government a long way into the businesses which give rise to these problems. In effect, they abandon the tenets of their own party and turn to state socialism as a solution for the difficulties presented by all three. . . . We are to go into the hydro-electric-power business. In other words, we are confronted with a huge program of government in business. . . .

I am defining a general policy. It does not mean that our government is to part with one iota of its national resources without complete protection to the public interest. I have already stated that where the government is engaged in public works for purposes of flood control, of navigation, of irrigation, of scientific research or national defense, or in pioneering a new art, it will at times necessarily produce power or commodities as a byproduct. But they must be a byproduct of the major purpose, not the major purpose itself. . . .

Years ago the Republican administration established the principle that such evils could be corrected by regulation. It insisted upon the principle that when great public utilities were clothed with the security of partial monopoly, whether it be railways, power plants, telephone or what not, then there must be the fullest and most complete control of rates, services and finances by government or local agencies. It declared that these businesses must be conducted with glass pockets.

Arizona's Parties Differ on Colorado River Project

The Republican state convention in Arizona has declined to make the Boulder Dam controversy a part of the state campaign. The Democratic convention, on the other hand, has pledged itself to carry the river development fight to the end and to oppose the Swing-Johnson bill in the courts if it is passed.

S.E.D. Activities in 1928

Directors' Meeting at Headquarters Approves What Has Been Done — "Franklin Specification" Plan Meets Favor—Officers for Coming Year

WORK accomplished under the program of the Society for Electrical Development since the first of the year was unanimously approved by its board of directors in annual meeting at New York on Oct. 23, when special emphasis was given by representatives of national associations to the fact that the S. E. D. is fulfilling in a practical way its mission both as a workshop and as an all-industry forum.

Among the activities which were reviewed by the directors as indicative that the society had firmly established its niche in the electrical family were steps taken so far by the Industry Sales Conference in its study to develop a national selling program, progress with such concerted programs as the "Franklin specification" plan for industrial and commercial lighting, extension of services in connection with the uniform ordinance activity, participation in and preparation of range and refrigeration programs in co-operation with the national associations, enlargement of field work among local electrical leagues, and a general attitude of interassociation and intercompany helpfulness in various departments of promotional activities.

Indorsement of the "Franklin specification" plan, developed by a committee of thirty, provides a companion piece to the "red seal" plan for adequate wiring in residences. The Franklin specification, the society believes, provides a simplified, interpretative and more or less non-technical specification of adequacy. It provides also for inspection after installation and certification of such installations. The original specification was developed by the Electric Association, Chicago, and R. Bourke Corcoran, its manager, reports that more than 200 installations have been made in a little more than two years.

W. W. Freeman, vice-president of the Columbia Gas & Electric Company

and chairman of the Union Gas & Electric Company of Cincinnati, was re-elected president of the society and the following were elected ranking vice-presidents in the order named: C. L. Chamblin, president of the Association of Electragists International and president of the California Electrical Construction Company; H. B. Crouse, president of the National Electrical Manufacturers' Association and president of the Crouse-Hinds Company of Syracuse; R. Bourke Corcoran, manager of the Electric Association, Chicago, and chairman of the Electrical League Council; George E. Cullinan, chairman of the executive committee of the National Electrical Wholesalers' Association and vice-president of the Graybar Electric Company, and P. S. Arkwright, president of the National Electric Light Association and president of the Georgia Power Company.

C. L. Edgar, president of the Edison Electric Illuminating Company of Boston, was re-elected chairman of the executive committee, and S. L. Nicholson, vice-president of the Westinghouse Electric & Manufacturing Company, vice-chairman. R. Bourke Corcoran replaced J. E. North and E. D. Tolles, managing director of the National Electrical Wholesalers' Association, replaced F. S. Price on this committee.

N.E.L.A.'s Merchandising Bureau Outlines Program

Definite steps were taken by the N.E.L.A. Commercial Section last week to carry forward the work started last year in the intertrade conferences. These conferences were participated in by the national officials of the various trades concerned in the retailing of electrical equipment. The N.E.L.A. merchandising committee decided to continue the activities of the conference. functioning as a guiding counsel to promote and defend the principles of merchandising adopted last year. It is planned to have members of the conference receive complaints of unfair merchandising practices.

Four of the committees now composing the Merchandising Bureau of the Commercial Section, under the chairmanship of F. D. Pembleton, held a series of meetings last week at the N.E.L.A. headquarters. The range committee is devoting itself largely to plans to bring about a general use of the sales plan book developed last year. The refrigeration committee is making plans for a broad national publicity program on the health value of adequate refrigeration. Definite plans are now being drawn for a comprehensive advertising program to be sponsored jointly by the central-station industry and refrigeration manufacturers. The domestic electric water-heating committee has under way a survey of existing practices in various parts of the country designed to aid central-station companies to establish rates and a sales policy which will build up the water-heating load.

Purchases and Mergers

Texas-Louisiana Power Company Sold to General Waterworks & Electric —Foshay Picks Up Vermont-Quebec Border Plants

NEGOTIATIONS for the absorption of the Texas-Louisiana Power Company by the General Waterworks & Electric Corporation of New York have been consummated, according to A. P. Barrett, chairman of the board of directors of both corporations. It was stated by Mr. Barrett that the General Waterworks & Electric Corporation, which was formerly called the General Waterworks Corporation, has purchased all of the common stock of the Texas-Louisiana Power Company, but that the two corporations will retain their present names. Both will have their general offices in Fort Worth. The Texas-Louisiana Power Company operates electric power plants and transmission lines and various other kinds of public utilities in Texas, Louisiana, Kentucky, Arizona, Oklahoma and New Mexico, while the General Waterworks & Electric Corporation has public utility holdings in Idaho, Texas, Indiana, Kentucky and Pennsylvania.

An international transaction involving four power companies in northwestern Vermont and southern Quebec has given ownership of the consolidated group to the W. B. Foshay Company through its public utility holding company, Public Utilities Consolidated Corporation. The Missisquoi Light Company of Highgate Springs, Vt.; the Alburg-Swanton extension in the same state, the Vermont-Quebec Power Company property of Abercorn, Quebec, and the St. Armand Parish Electric Light Company of St. Armand, Quebec, are included in the deal. The four companies serve a district with an estimated population of 1,200 or more.

The New York Public Service Commission has denied the application by the New York Power & Light Corporation for authority to acquire the Ticonderoga Electric Light & Power Company.

John McGaughey, general manager Canton (N. Y.) Electric Light & Power Company, has bought from the estate of J. E. Johnson the controlling interest in the company.

The Danbury & Bethel Gas & Electric Light Company, Danbury, Conn., has acquired the business and equipment of the Danbury & Bethel Power & Transportation Company, which supplies power to Newtown and the district between Monroe and Danbury.

The Gould Electric Company of Presque Isle, Me., has filed a petition with the Maine Public Utilities Commission for approval of the merger with the company of small northern Maine electric light and power companies at Cyr, Ashland, Easton, Katahdin, Fort Kent, Maple Grove, Milo, Presque Isle, Sherman, Westfield and Stockholm. These plants, like the Gould Electric Company, are controlled by the Central Gas & Electric Company of Chicago.

The Luckey (Ohio) Light & Power Company, organized in 1918 to serve that town and surrounding country, has been sold to the Toledo, Fostoria & Findlay Railway Company for $35,000.

Financial interests in Greenfield, Ohio, are said to be considering the erection of a hydro-electric dam on Paint Creek and to have offered to buy the local power plants at Greenfield and Bainbridge.

The Toledo (Ohio) Edison Company has purchased stock control of the Archbold Electric Service Company, serving more than 500 customers in the village of Archbold, about 45 miles west of Toledo. The Archbold company is surrounded by other Toledo Edison and Lake Shore Power Company properties. For several years it has purchased its energy wholesale from the Lake Shore Power Company, a Doherty unit.

Properties of the Gunderson Brothers, Gunderson Electric Company and Kenyon (Minn.) Light & Power Company have been sold to the Utilities Development Company of Chicago. The property includes 75 miles of transmission lines, substations and other properties in Minnesota.

The Muscatine (Iowa) Lighting Company, subsidiary of the United Light & Power Company, has sold its distribution system in Muscatine to the municipal light plant of that city for $73,924.

The Interstate Power Company of Nebraska, which, with headquarters at Dubuque, Iowa, serves O'Neill and other places in Nebraska, has purchased the municipal lighting plant at Herrick, S. D. The voters approved by two to one.

The Nebraska Power Company has acquired the distributing systems in the villages of Winslow and Leshara.

The village of Carleton, Neb., has voted to sell its distribution system to the Southern Nebraska Company, which supplies energy at wholesale. The Iowa-Nebraska Light & Power Company's proposal to buy the municipal plant at Adams will soon be passed upon.

Two companies, the Wisconsin Valley Power & Electric and the Wisconsin-Michigan Power, are reported to be trying to buy the Eagle River Light & Power Company's system. It is reported that the Wisconsin Valley company has offered $235,000 for the property.

Whether the town of Adrian, Minn., shall sell its electric light plant to I. C. Elston, Jr., for $55,000 will be decided by the voters on Oct. 24.

Purchase by the Duke interests through the Southern Public Utilities Company of the Lancaster (S. C.) Light & Power Company is announced.

By decision of the Cedar Bluff (Va.) Town Council the lighting plant of the town will be sold to the Appalachian Electric Power Company.

The Blue Ridge Power Company, operating in Sperryville, Rappahannock County, which recently lost a court action to prevent the Page Power Company from completing its line through that village, has sold out to its late rival, according to an announcement from the Page Power Company's offices at Shenandoah, Va.

The Furman Shoals water-power development on the Oconee River, near Milledgeville, Ga., has been purchased by the Appalachian Power Company from the Oconee Electric Light & Power Company.

Consolidation of the Macon Railway & Light Company, the Central Georgia Power Company, the Central Georgia Transmission Company and the Georgia Public Service Corporation, all of Macon, Ga., with the Georgia Power Company, which had held a majority of the stock of the corporations, has been sanctioned by the stockholders of the last-named.

Municipal electric plants at Pavo and Barwick, Ga., have been sold to the Georgia Light & Power Company.

The Tylertown (Miss.) Electrical Company and the Tylertown Ice Company have

been purchased by the Mississippi Central Power Company. It is understood that the purchase price was $80,000, with other consideration.

The Southern Engineering & Manufacturing Company has offered the city of South Jacksonville, Fla., $350,000 for its utility plant, according to the president of the City Council. Frank Owen, commissioner in charge of the Jacksonville utility system, which serves South Jacksonville wholesale, says that if the South Jacksonville plant is for sale, he desires to place a larger bid for it.

The Jefferson County Light & Power Company, holding a franchise for serving Golden and Mount Morrison, Colo., with electricity, has obtained permission from the Public Utilities Commission to transfer its rights to the Colorado Central Power Company.

Residents of Tehachapi, Kern County, Cal., have voted to sell the city's electric distribution plant to the Southern California Edison Company for $23,500.

Sale of the Novato Utilities Company to the Pacific Gas & Electric Company for $100,000 has been arranged, subject to commission approval. The Novato company operates light, telephone and water service in the town of Novato, in Marin County.

It has been announced that the W. B. Foshay Company of Minneapolis has made arrangements to take over the plant and equipment of the Sauble Falls Light & Power Company, supplying energy to Wiarton, Ontario. The present plant will be connected with the Walkerton and Southampton lines, which were acquired recently by the purchasing company.

The Canadian Light & Power Company, which controls electric services in Rio de Janeiro and São Paulo, has acquired the electrical companies at São José and Dos Campos, both in the State of São Paulo. The price was given as more than $500,000. Within recent months the Canadian company has acquired various electrical systems in Brazil for purposes of development.

Eight California Cities to Vote on Colorado River Project

Voters in eight incorporated cities in Los Angeles County will have an opportunity to express themselves on the Colorado River Dam project at the general election Nov. 6, in accordance with a resolution which has been adopted by the County Board of Supervisors. Under the resolution, which was prepared by James H. Howard, attorney for the Colorado River Aqueduct Association, the electors of Los Angeles, Beverly Hills, Culver City, Burbank, Glendale, Pasadena, San Marino and Santa Monica will vote on whether their community shall be embraced in the Metropolitan Water District of Southern California, which was initiated by the city of Pasadena.

Similar action on the part of the cities of Anaheim, Orange and Santa Ana in Orange County will be sought by the Colorado River Aqueduct Association, according to Mr. Howard. Under the provision of the metropolitan water act passed by the California State Legislature in 1927 a group of cities may cooperate with the object of obtaining domestic water supply from a common source.

Henry Statue Dedicated

Memorial to American Pioneer in Electrical Art Unveiled on Site of His Early Labors—Dr. John H. Finley Eulogizes His Achievements

WITHIN a few feet of the room in the old Albany Academy where Joseph Henry made the electromagnetic experiments that first established the possibility of communication by wire a monument to him was dedicated on Oct. 18 as part of the proceedings connected with the annual convocation of the Regents of the University of the State of New York. Dr. John H. Finley, former State Commissioner of Education, made the oration at the unveiling of the monument, which was presented to the city by William Gorham Rice, vice-president of the Albany Institute of History and Art, and accepted by Mayor Thacher. Cadet officers of the academy unveiled the memorial to the accompaniment of a fanfare of bugles and a salvo of bells from the municipal carillon. More than two hundred persons assembled in Academy Park for the ceremony.

I arranged around one of the upper rooms in the Albany Academy a wire of more than a mile in length through which I was enabled to make signals by sounding a bell.—*Joseph Henry.*

JOSEPH HENRY
Pathfinder in Science
Born in Albany
1797
Died in Washington
1878

Discovered self-induction, and his contributions to the knowledge of electromagnetism are essential to the electric telegraph, the telephone, the dynamo, the motor and radio.

The monument is in the form of a statue of the scientist mounted on a three-winged base which bears a three-part inscription engraved on its left, center and right wings.

Kansas Records Smashed

"Standing Room Only" the Rule at Lively Sessions of the State Section of the N.E.L.A.—Women Turn Out in Force.

ATTENDANCE records of more than thirty years were shattered when 106 more delegates registered at Wichita for the convention of the Kansas Section of the N.E.L.A. on Oct. 18 and 19 than had ever before been present at any annual gathering of like kind in the state. Almost half of the more than 300 delegates were women of the industry. Hotel and meeting-room facilities were taxed beyond capacity, and sessions were so well attended that some were forced to stand.

Challenging the soundness of undue governmental interference with legitimately conducted industry and assailing proposals for governmental invasion of the business domain, convention speakers gave vigor to the program keynote. In his opening address on "Pride in Public Utility Performance," Arthur Groesbeck, Manhattan, president of the section, paid tribute to the industry's achievements and denounced political efforts to undermine public confidence in the business. He made a plea for better education of employees. Rolla Clymer, editor of the El Dorado *Times* and vice-president of the Kansas Editorial Association, told the convention that the newspaper fraternity would strongly resist any effort to have the government projected into private business enterprise.

Many delegates stood to hear F. W. Peek, Jr., General Electric Company, Pittsfield, Mass., describe "Progress in the Mastery of Lightning." His address was accompanied by lantern slides.

In speaking on "America — What Does It Have and How Has It Been Achieved?" Col. George T. Buckingham, general counsel of the North American Light & Power Company, Chicago, gave a graphic presentation of industrial development from Pilgrim days to the present time. One word — power — accounts for America's industrial, financial and social supremacy, he told his listeners.

"Kilowatts and the Corn Belt" formed the topic discussed by Thorne Browne, managing director Middle West Division, N.E.L.A., who predicted that electricity would eventually give great impetus to the decentralization of industry and the further improvement of conditions in the industrial field. H. S. Hinrichs, a prominent rural service engineer now associated with the Kansas Power & Light Company, Topeka, spoke on "The Kilowatt

Party Proposes a Farm Relief Platform." Mr. Hinrichs was formerly head of all experimental work on the farms of the rural electrical laboratory established by the state Committee on the Relation of Electricity to Agriculture.

More than thirty women appeared in addresses, a playlet, first aid and safety demonstration work and other events. Among the speakers were Isabell Davie, N.E.L.A. headquarters staff; Betty Ewing, Topeka; Elsie McMann, Wichita, and Aline Schrader, Abilene.

Round table sessions, an innovation at Kansas Section meetings, drew heavy attendance to discuss accounting, commercial, public relations, rural, technical and accident prevention work. Formal reports of standing committees were dispensed with, the chairman of each committee appearing on the program for a five-minute talk on a subject of his own choosing.

"As Seen by the Sales Manager" was the signal for a rapid-fire series of observations by F. H. McCullough, Kansas Gas & Electric Company, Wichita. Mr. McCullough took issue strenuously with those who propose the abolition of merchandising activities by utility companies. Ralph Smalley, Lawrence, president Middle West Division, N.E.L.A., gave expression to the power executive's conception of the value of women's organizations in the utility field.

At the annual dinner Friday evening Charles Evans, president Home Life Insurance Company, Little Rock, Ark., delighted the largest banquet crowd ever present at a state section convention by an address full of humor.

Frank M. Stone, president Kansas Utilities Company, Fort Scott, was elected president of the organization; D. E. Ackers, assistant general manager Kansas Power & Light Company, Topeka, was made first vice-president, and H. S. Kilby, general manager Kansas Power Company, Salina, became second vice-president.

Canadian Electrical News Is Abundant

Toronto Amalgamation Completed—Ottawa Acquires New Source of Supply—New Brunswick's Water Power Growing—Activities in Western Provinces

AMALGAMATION of the old Toronto Electric Light Company's system and the Toronto Hydro system, under way since 1920, has now been completed. The cost of the work with rehabilitation will be between two and three millions, it is estimated. The Toronto Electric Light system was allowed to run down for several years before the Mackenzie interests sold out to the Hydro, thus necessitating a large amount of reconstruction, which has now been overtaken; the two systems have been united and duplication has been overcome.

The Hydro-Electric Commission of Ottawa stands to receive 20,000 hp. out of 100,000 hp. which the Ontario Hydro-Electric Power Commission has contracted for from the Gatineau Power Company for distribution to municipalities in eastern Ontario. This is a separate contract from the 260,000 hp., on which delivery started on Oct. 1 over the 220-kv. line from the Paugan Falls power station to Toronto. The Ottawa supply is to be received at 110,000 volts from the Farmers Rapids plant, which is interconnected with the Chelsea power house of the Gatineau Power Company. The new transmission line, on which work is under way, crosses the Ottawa River at Remic Rapids a few miles above the city. The Ottawa Hydro Commission will erect a new substation at an approximate cost of $100,000 to receive the new power and step down the voltage to 11,000.

Activity in New Brunswick

Eighty miles of the line survey for the tranmsission of hydro-electric power from Grand Falls to Dalhousie, in the Province of New Brunswick, has been completed and the engineers are starting on the final lap of 30 miles. The transmission line will span the northern part of New Brunswick, reaching from the power plant at Grand Falls to a paper mill now in course of construction at Dalhousie for the International Paper Company. The projected line is expected to carry between 30,000 hp. and 40,000 hp. at about 132,000 volts. Premier Baxter of New Brunswick recently stated that the Grand Falls plant would not be capable of its full development of 80,000 hp. unless further storage could be secured. The seasonal power, the Premier hinted, might be made continuous by the addition of a steam standby or the development of other small water powers to fill in the gap. The development contemplated on the present storage capacity is 60,000 hp. The first unit of 20,000 hp. was started on Oct. 1.

Investigations have also been made recently of power possibilities on the St. John River below Grand Falls. The commission made an extensive investigation of the 40-mile reach between Woodstock and Hawkshaw, where a total head of about 60 ft. exists, which with a regulated flow of 5,000 sec.-ft. would yield 30,000 continuous horsepower.

Last year the Bathurst Company made a thorough investigation of the Nipisiguit River and established that the total power available from five sites on that river, including the Great Falls site now developed, was in the vicinity of 40,000 continuous horsepower. Of the undeveloped sites, the company has now under active consideration the development of one known as Rough Waters, near the mouth of the river, where an installation of from 8,000 hp. to 10,000 hp. may be made. The power would be used principally in the company's paper mill at Bathurst.

The developed water powers of the province now total 47,000 hp., including the Musquash development of the Power Commission, the Aroostook Falls development of the Maine & New Brunswick Electric Power Company and smaller plants.

The Avon River Power Company proposes to install a plant at Fall River, Halifax County, Nova Scotia, with an installed capacity of approximately 500 hp., to cost about $107,000.

In the Western Provinces

In connection with the proposed hydro-electric development at Slave Falls on the Winnipeg River, Manitoba, the Winnipeg City Council has instructed the city solicitor to prepare a bylaw for presentation to the ratepayers in November asking authority to raise $6,500,000 to be used for the initial development of the site. It is expected that the entire project will cost in the neighborhood of $10,000,000 and that close to 100,000 hp. will be eventually developed.

In a recent statement regarding the renting of the Seven Sisters power site on the Winnipeg River to the Winnipeg Electric Company, Premier John Bracken of Manitoba points out that as a result of the revenue to be received from the company in rentals the provincial government will be able to carry out its policy of assisting main-line extensions and town and city extensions by bonuses. At present preliminary arrangements are being made by the Manitoba Power Commission for a power extension scheme with Virden as the central point.

A contract recently concluded provides for the supply by the Calgary Power Company of the city of Calgary's entire power requirements up to and including 1940. The city's 14,000-hp. steam plant has been leased to the company for the purpose of this contract. The Horseshoe and Kananaskis developments, which are the company's principal sources of power supply, have a combined installation of 52,000 hp. By November, 1929, the company's hydro-electric generating capacity will be increased to 68,000 hp. through development of the Ghost power site on the Bow River, 28 miles west of Calgary.

An experiment bearing on the Bridge River hydro-electric power project of the British Columbia Electric Railway Company was recently carried out at the company's fully developed plant at Alouette, B. C. In order to determine the position of a secondary dam to be built at the foot of the huge dam now being designed for Bridge River, a miniature of the small dam was erected in the spillway of the Alouette Dam. The angle of fall of the apron and other factors were proportionate to these planned for Bridge River, and an adjustable log crib supplied the secondary dam. The reaction of the water

as it fell was observed through one side of the miniature, which was of plate glass.

Outdoor Metering Disapproved by New York Men

Disapproval of outdoor metering practices was voiced at the annual meeting of the Electric Meter Section of the Empire State Gas and Electric Association, held at Rorick's Glen, Elmira, N. Y., on Oct. 18 and 19. The subject was introduced by J. N. Mayer of the Associated Gas & Electric System, who presented his view of the advantages and disadvantages of the practice. These included a comparison of probable time requirements for reading, annoyance to customers, metering problems, personnel difficulties and potential economies in metering expenses. In the discussion which followed the feeling expressed was practically unanimous against outdoor metering either by means of protective casings or by meters designated as waterproof.

The increasing magnitude of revenue losses due to tampering with meters and entrance services in certain districts was recognized by H. J. Klumb of the Rochester Gas & Electric Corporation, who outlined the problem as it had been encountered and called upon representatives of a number of utilities to explain the policies of their organizations in dealing with and solving the difficulties involved. The failure in many cases to insure either adequate penalties or sympathetic co-operation in the courts was deplored, and the problem was viewed as becoming largely a battle of wits between meter departments and dishonest individuals to whom the utilities are in many cases forced to give service without proper return.

The status of the meter department of local organizations when involved in group management was outlined by W. T. Greene, Northern New York Utilities, Inc., who pointed out the probable trend in executive policies and in organization. Methods of checking phase angle and ratio of instrument transformers in the field were covered by G. J. Roehrig of the Syracuse Lighting Company.

Metropolitan network problems for three-phase, four-wire, and two-phase, five-wire distribution were outlined, respectively, by A. J. Allen of the United Electric Light & Power Company and A. F. Kochendorfer of the New York Edison Company. Other papers included "The Oscillograph and Its Applications to Metering Problems," by C. A. Mead of the Westinghouse Electric & Manufacturing Company, and "Bushing-Type Current Transformers," by W. K. Dickinson of the General Electric Company. Inspection trips were made to the Corning Glass Works and substations of the Elmira Water, Light & Railroad Company.

Officers for the coming year are: Chairman, G. B. Teevan, Brooklyn Edison Company; vice-chairman, W. L. Carr, New York Power & Light Corporation. W. J. Consler of the Rochester Gas & Electric Corporation, retiring chairman, presided. About seventy men attended the sessions.

Briefer News

EXPANSION OF A SOUTH GEORGIA UTILITY.—Field engineers of the Georgia Power & Light Company have completed surveys for the extension of the company's transmission lines into the towns of Hoboken, Nahunta, Schlattersville, Atkinson and Waynesville. So far this company has invested approximately $7,000,000 in its south Georgia and north Florida enterprises, and its expansion still goes on steadily.

GROWTH OF AN INDIANA LOCAL COMPANY.—Holland, Folsomville, Jockeytown and Selvin, Ind., will soon be supplied with electric light and power by the Boonville Electric Light & Power Company, which is extending its lines to the north of Boonville and into Dubois County. A little later on the line from Holland may be extended to Stendal, Ind. In the past three years the Boonville company has built lines to Chandler, Stevenson and Tennyson.

ANOTHER UNIT FOR BIG FORKS (MONT.) PLANT.—The Big Forks hydro-electric plant of the Mountain States Power Company on the Swan River in Montana is being augmented by the installation of a 1,700-kw. generating unit, which is expected to be in operation by Dec. 1, the work of installation having started in August. This unit is rated at about 2,250 hp. Foundations of the plant are being in part reconstructed to permit of two more units of the same size being installed when necessity demands.

BUFFALO GENERAL ELECTRIC'S BIG TRANSFORMER ARRIVES.—One of the largest three-phase electrical transformers ever built arrived in Buffalo this week to be installed in the addition being built to the Charles R. Huntley station of the Buffalo General Electric Company. This 75,000-kw. apparatus was shipped from the General Electric Company's Pittsfield plant, taking five days to make the trip because of roundabout routing to avoid low bridges.

IMPROVING TRANSMISSION SERVICE IN OKLAHOMA.—McAlester and other towns which were served by the Southwest Power Company, recently taken over by the Public Service Company of Oklahoma, will be doubly assured of a plentiful and continuous supply of electricity with the completion of a line about 35 miles long now being constructed from Weleetka to McAlester. The power plant at McAlester will be kept running full force to serve the mining district and 30 communities in that region. The line connected to the Weleetka power plant of the company will be used for supplemental service.

WESTERN OKLAHOMA MEN MEET.—"Seasonable Loads" by R. W. McClure. "Home Service" by Ruth Van Sant, "Southwestern Oklahoma Development" by E. R. Ernsberger, "Applications of Electricity to Farming in Oklahoma" by R. E. Hayman, "Mechanical Refrigeration" by A. C. Henry, with other talks and reports, were the items listed on the program of the Western District conference of the Electric Light and Power Division of the Oklahoma Utilities Association at Chickasha, Okla., on Oct. 22.

CONFERENCE ON IMPREGNATED PAPER INSULATION.—Research in the field of impregnated paper insulation is being actively prosecuted in a number of university and industrial laboratories, according to the committee on electrical insulation of the National Research Council. This committee has arranged a conference on the subject, which will be held at the School of Engineering of the Johns Hopkins University, Baltimore, on Nov. 16 and 17, for reviewing, discussing and further co-ordinating the work under way. Prominent technicians have promised to attend.

NEW YORK COMMISSION APPROVES ONEIDA-CORTLAND LINE.—The 54-mile, 110-kv. transmission line to be built between Oneida and Cortland, N. Y., by the New York Power & Light Corporation, which will involve a new substation near Cortland, has been approved by the New York Public Service Commission. Cost of the transmission line is put at $572,000 and of the substation at $266,400. Interconnection with the system of the Binghamton Light, Heat & Power Company and an extension of the line to Ithaca are contemplated.

PLANS FOR NEW FRANKLIN INSTITUTE BUILDING.—Plans for the new home to be erected on the Parkway, Philadelphia, for the Franklin Institute and Memorial are maturing. Construction and endowment will cost $7,000,000, and the structure will contain museums covering all phases of science, for which Dr. Howard McClenahan, secretary of the Franklin Institute, has been formulating ideas. These will contain such electrical pioneer devices as the Benjamin Franklin electrical apparatus and the first Brush arc-light dynamo.

INSULL INTERESTS THOUGHT TO CONTEMPLATE WATER-POWER PLANTS ON MIDDLE WEST STREAMS.—Possible construction of a water-power plant at Rockton, Wis., is foreseen in the purchase by the Wisconsin Light & Power Company of the American Tar Products property at Rockton, including a dam, millrace and 230 acres of land in vicinity of the dam. The Wisconsin utility, which is a part of the Insull

properties, has acquired other sites in southern Wisconsin, northern Illinois and eastern Iowa and will, it is believed, establish a series of water-power units in that territory. Poles for transmission lines have already been erected from the Rockton site to adjacent towns.

MIDWEST POWER CONFERENCE AND SHOW.—Feb. 12 to 16, 1929, will be the date of the Midwest Power Conference and the fourth Midwestern Engineering and Power Exposition, to be held in the Coliseum in Chicago. The director of the Power Show says that it will be even better than before, with careful co-ordination and grouping of exhibits and showing machinery in operation as noticeable features.

NEW UNIT FOR DALLAS PROMISED.—Plans for the addition of a 25,000-kw. generating unit to the plant of the Dallas Power & Light Company at a cost of $2,750,000 have been approved by the City Commission, and the company is expected to begin construction soon. Auxiliary equipment, new turbine and boiler rooms and a new smokestack are included. The installation will increase the capacity of the plant by 40 or 50 per cent and will probably take care of the light and power needs of Dallas for some time to come.

RICHMOND'S ELECTRICAL EXPOSITION.—The Richmond (Va.) Electrical League announces that the coming electrical exposition in that city, to be held at the Mosque on Nov. 5 to 10, will be a comprehensive one of state-wide character. There will be 51 booths and in addition a large number of educational exhibits, among them a model electrically equipped home, a model farm electrically complete, a model airport with its intricate system of lighting and other features. Officials of the league estimate a total attendance of fifty thousand.

WISCONSIN LEGISLATIVE WATER-POWER COMMITTEE SOON TO HOLD LAST HEARING.—Twelve questions bearing on water-power development, the relative cost and efficiency of municipal and private plants and the regulation of public utilities are to be propounded to witnesses by the committee of the Wisconsin Legislature which was appointed to study the hydro-electric resources of the state when the last public hearing is called at Madison on Nov. 9. The committee has been studying the matter for a year, paying especial attention to the Ontario Hydro-Electric Power Commission's system. Organizations and individuals are invited to present any facts in their possession.

APPROACHING MUNICIPAL COMPETITION ANNOUNCED IN OREGON.—Representatives of the Oregon municipalities of Eugene, McMinnville and Milton assert that in the near future the electric utilities owned and operated by these cities will be enlarged so as to be able together to generate approximately 35,000 surplus horsepower. This will be offered for sale throughout territories adjacent to the three cities. If this prophecy proves true, Eugene will compete directly with the Mountain States Power Company, McMinnville will necessarily enter into competition with the Yamhill Electric Company, while Milton will operate more or less in territory soon perhaps to be occupied by the Eastern Oregon Light & Power Company.

NEW ENGLAND POWER MEN MOVE TO BOSTON.—Offices have been established by the New England Power Association at 89 Broad Street, Boston. The engineering, sales and operating staffs were transferred from Worcester within the past few days, and the offices of President F. D. Comerford and other executives were transferred this week from 50 Congress Street, Boston, to the new address. Three floors of the new Public Service Building are now occupied by the association, which controls the New England Power Company and the Narragansett Electric Company of Providence, besides railway and other properties serving central New England.

DIESEL ENGINE PLANTS CONTINUE POPULAR IN SMALL NEBRASKA COMMUNITIES.—The City Council of Wausa, Neb., has contracted with the Western States Utility Company, of which Heber Hord is head, to build a small Diesel-engine plant, to become the property of the city after the builder, the Wausa Electric Company, has repaid itself out of the revenues. The city is now supplied by the Interstate Power Company of Dubuque, as were formerly Hartington and Neligh, where Diesel-engine plants have been constructed; Ponca, where the council has contracted to put in a double-unit 520-hp. plant, and Bloomfield, where the city voted bonds for its own plant. The Hartington and Wausa plants are to be connected by a high-tension line as standby equipment.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue for July 7, page 48.]

American Institute of Electrical Engineers — Regional meeting, Atlanta, Oct. 29-31. F. L. Hutchinson, 33 West 39th St., New York.

National Electrical Manufacturers' Association—Briarcliff Lodge, Briarcliff, N. Y., Oct. 29-Nov. 1. S. N. Clarkson, 420 Lexington Ave., New York.

Electrical Credit Association—Middle and Southern Atlantic States Division, Philadelphia, Nov. 1; J. W. Crum, 1211 Arch St., Philadelphia. Central Division, Palmer House, Chicago, Nov. 22-23; F. P. Vose, 1008 Marquette Bldg., Chicago. New York Division, New York, Dec. 17; W. J. Kreger, 261 Broadway, New York.

National Electrical Wholesalers' Association—Chicago, Nov. 12-16. E. Donald Tolles, 165 Broadway, New York.

National Association of Railroad and Utilities Commissioners — New Orleans, Nov. 13-16. J. B. Walker, 270 Madison Ave., New York.

Public Utilities Association of Virginia—Hotel Roanoke, Roanoke, Va., Nov. 21-22. A. B. Tunis, 301 East Grace St., Richmond, Va.

NEW ADIRONDACK INTERCONNECTION.—An end to power troubles at the famous pioneer Adirondack resort district around Saranac Lake, N. Y., is thought to have been assured through an arrangement for interconnecting the Paul Smith Electric Light & Power Company lines with the system of the Eastern New York Electric & Gas Company of Plattsburg, owned by the Associated Gas & Electric System.

BALTIMORE AND THE PENNSYLVANIA RAILROAD APPROACH AGREEMENT ON ELECTRIFICATION.—The city of Baltimore and the Pennsylvania Railroad are said to be "not far apart" in the negotiations over the improvement and electrification projects of the latter. The Pennsylvania ordinances that were revised by the city solicitor have been rewritten by attorneys for the company and are ready for submission to Mayor Broening's railroad commission, headed by Alexander Armstrong. It is understood that the company has agreed to certain concessions, in an effort to meet the city more than half way. The company is reported as having a new plan for the electrification of the local terminals. Pennsylvania officials say they are eager to begin work on the projects early in the new year.

NORTH CENTRAL ASSOCIATION HOLDS ACCOUNTING CONFERENCE AT MINNEAPOLIS.—The third annual accounting conference of the North Central Electric Association was held on Oct. 19 and 20 in Minneapolis. Chairman W. D. Hodgson of the Accounting Session, Secretary John W. Lapham of the North Central association, J. F. Ford of the Philadelphia Electric Company, W. L. Hatch of the Otter Tail Power Company and others spoke on the opening day's sessions, President L. M. Pharis of the North Central association and J. J. Molyneaux of the Northern States Power Company at the banquet, and Fred R. Gamble of the Montana-Dakota Power Company and E. G. Kellett of the Northern States Power Company on the second day.

LARGE STEEL-POLE INSTALLATION IN SALT RIVER VALLEY.—The Salt River Valley Water Users' Association of Phoenix, Ariz., recently purchased equipment and commenced construction of one of the most extensive single installations of steel transmission poles in the United States. The project includes nearly 600 miles of 11,000-volt, 4,000-volt and distribution lines, which will form a network of lighting and power circuits in the Salt River Valley of Arizona. Approximately ten thousand poles are required, varying from 30 ft. to 50 ft. in height. The conductors are carried on Weltrus copper-alloy

steel poles manufactured by the Truscon Steel Company of Youngstown, Ohio. Much interest is being shown in the installation by operators in the Southwest, where the high temperatures, excessive dryness and prevalence of termites have made the subject of pole depreciation a matter of serious consideration.

READY TO BEGIN TABLE ROCK DEVELOPMENT.—The Empire District Electric Company of Joplin, Mo., is reported as in readiness to begin work on its projected White River dam at Table Rock just as soon as the necessary approval from the Federal Power Commission and the Missouri Public Service Commission is bestowed. Late statistics concerning this project are that it will have a capacity of 100,000 hp. during low-water periods, cost $3,500,000 and involve the creation of a lake covering 27,000 acres of land. Three years would probably be needed to build the dam.

THE "ELECTRAGIST" MOVES TO CHICAGO.—Announcement has been made by Howard Ehrlich, president of the Electrical Trade Publishing Company, Chicago, of the purchase by that company of the *Electragist*. Beginning with the November, 1928, issue, the name will be changed to *Electrical Contracting*. The *Electragist* has just completed its twenty-seventh year as the official journal of the Association of Electragists International, originally the National Electrical Contractors' Association of the United States. S. B. Williams will continue as editor, with headquarters in Chicago instead of New York, where the paper has heretofore been published.

HIGH RATES FOR ENERGY FROM THE SHANNON?—From Dublin it is reported that surprise has been caused throughout the Irish Free State by the Shannon Electricity Supply Board's announcement of the terms on which electrical energy will be supplied to 23 small towns in the Province of Leinster. Energy from the Shannon will not be available for another year, but in the meantime the board proposes to make use of the auxiliary plant of the Dublin Corporation's undertaking. A temporary transformer station will be established at Inchicore, near Dublin, and energy will be supplied to the towns in question at the beginning of December. The scale of charges is higher than anybody had anticipated. It will be based on the principle of a multipart tariff. Every householder will pay a certain fixed sum reckoned on his poor-law valuation and in addition he must pay 4 cents per kilowatt-hour for electricity consumed. The fixed rate in the case of houses whose valuation does not exceed $25 will be 12 cents per week, while in the cases of houses of $100 valuation and over it will be 60 cents per week. These rates will bring heavy bills, and the Irish people are hoping that they do not presage charges for Shannon electricity away above the 2-cent rate once hopefully predicted.

Recent Court Decisions

CONDEMNATION OF PUBLIC PARK BY POWER COMPANY NOT PERMITTED. — The Central Power Corporation, Montpelier, Vt., has lost its case against the Fellows of the Middlebury College and the State of Vermont. The corporation sought to condemn for a power project a park presented by the late Joseph Batel to Middlebury College and the State of Vermont jointly. The Vermont Supreme Court affirmed a decree overruling the demurrer of the corporation, which wanted the land as an important unit in projected power developments between Ripton and East Middlebury. The Vermont Public Service Commission is sustained by the decision.

CONTRACT OF BUILDING COMPANY TO SELL TO TENANTS ENERGY FURNISHED BY UTILITY VALID.—The Ohio Court of Appeals has determined, in Jonas vs. Swetland Company, a building concern, that the defendant had authority to enter into a contract with the plaintiff, a tenant, to sell him electrical energy purchased from an electric utility without any regulation by a court concerning the price to be charged. The Court of Appeals said that the building company could sell energy, although it was not a utility; that the utility company generating the electricity could not be constrained to make a separate contract with every tenant of a large building, and that there was no obligation upon the landlord to charge the occupants of his building no more than the wholesale rate he himself paid. (162 N.E. 755.)*

ORDINARY AND EXTRAORDINARY OBSOLESCENCE.—Affirming in part and reversing in part the judgment of the Circuit Court in Baltimore in United Railways & Electric Company vs. West, the Court of Appeals of Maryland pointed out that the power conferred on the Public Service Commission is legislative in character notwithstanding the forensic nature of its exercise, observed that the method of calculating depreciation reserve by an allowance of a percentage on the gross revenue of a public utility is "artificial, illogical and unsound," and declared that while a commission must make a depreciation allowance for ordinary obsolescence—a tangible and concrete thing—an allowance for extraordinary obsolescence may properly be denied, such obsolescence having seldom taken place in the past and question as to whether it will occur in future constituting a matter of speculation and conjecture. (142 At. 870.)

LONG-STANDING LITIGATION OVER POWER RIGHTS ON NEW YORK STATE BARGE CANAL ENDED.—A suit brought by John Dunlop's Sons and the Senoso Paper Company, both of Phoenix, N. Y., against Sweet Prothers Paper Manufacturing Company in 1919 has been ended after being referred for settlement to Justice Nathaniel A. Foote of Rochester with authority to determine the rights of the respective mills in waters in excess of what the state may need for Barge Canal purposes from the pool above Phoenix Dam. One of the important points in the decision is that the rights of the state are confined to the water needed actually for canal purposes, thereby rejecting the Sweet company's claim that the state and not its adversaries owned power rights in dispute. The Dunlop firm and the Senoso company are held to be entitled to 350 sec.-ft. of the surplus waters and Sweet Brothers to approximately 10 sec.-ft. A third appropriation of 966 sec.-ft. on the so-called Peck right is now held by the Dunlops. In addition, the Sweet company is to have 924 sec.-ft., and all remaining waters are to belong to the Dunlop interests. The Sweet interests contended that the Peck right was non-existent by a merger of title with an inferior right. This contention was rejected. The Dunlop interest in 1918 acquired the site of two mills destroyed by fire in 1916. When the Sweet company began deepening the race at Hart's Creek after the Dunlop purchase the Dunlop interests asked an injunction and a determination of the various rights.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

REFUSAL TO PERMIT PURCHASE OF SMALL UTILITY AT INFLATED PRICE.—The New York Power & Light Corporation of Albany applied to the New York Public Service Commission for permission to acquire the capital stock of the Ticonderoga Electric Light & Power Company, which now distributes energy purchased from a paper company and has no generating facilities or connections with other companies. The New York company serves territory adjoining that of the Ticonderoga company and desired to make connections with lines on the north and south. The Ticonderoga company's capital stock is $16,000, par value $100 a share, and evidence showed that the value of the shares to be purchased for $275,000 was apparently $58,574, the purchasing rate being more than $1,700 a share. Purchase on this basis, the commission held, was not in the interest of the public or the stockholders of the purchasing company.

VIEWS OF OREGON COMMISSIONERS ON COUNTY COURT JURISDICTION AND ON REGULATION OF MUNICIPAL UTILITIES.—In an informal opinion the Oregon Public Service Commission maintains that county courts in that state are without legal recourse in the matter of granting "blanket franchises" to public utilities in any given district. The commission holds that franchises of this character are without force in so far as giving to any one operator the exclusive right to serve the public is concerned. While the county courts may exercise a certain degree of jurisdiction over the county highways, Commissioner Bean says the fact still remains that the commission retains authority to regulate and supervise in all matters affecting actual operations of the utilities, whether located on the highways or not. Mr. Bean holds also that the laws should be so amended as to give the commission complete jurisdiction over that portion of all municipal utility property located outside of city limits, in use and used for the benefit of the public. "It is not necessary," he says, "that regulation extend to all municipal operations, as the voter-owners within the municipalities are fully capable of regulating their own service. But in the case of the consumer outside of the city, I believe he should have the benefit of this department's protective laws and rules."

News About Electrical Men

K. Edgcumbe New President of I. E. E.

Lieut.-Col. Kenelm Edgcumbe, chairman and managing director of Everett, Edgcumbe & Company, has been elected president of the Institution of Electrical Engineers, to succeed Archibald Page. From the earliest days of his career Lieut.-Col. Edgcumbe has been identified with the design of electrical-measuring instruments, protective relays and similar gear and on these subjects he has contributed numerous papers to various technical institutions.

Following the completion of his education at Harrow, Dresden and University College, London, he became an apprentice at the Arc Works, Chelmsford, of Messrs. Crompton & Company. After severing his connection with that organization he affiliated himself with the Northampton Polytechnic in London, where he spent more than three years as a lecturer. In 1900 he joined E. I. Everett in founding the firm of Everett, Edgcumbe & Company, of which at the present time he is chairman and managing director. Lieut.-Col. Edgcumbe has not devoted his attention exclusively to the manufacturing side of the British electrical industry. For the past fifteen years he has participated in the work of the International Electrotechnical Commission, of which he was last year appointed honorary secretary. In addition he is chairman of the sectional committee on illumination of the British Engineering Standards Association, a member of the electrical sectional committee, on which he represents the Institution of Electrical Engineers, besides serving on a number of sub-committees. He is a member of the council of the Electrical Research Association and vice-president of the International Illumination Commission. His connection with the Institution of Electrical Engineers dates back to 1894. He has been the recipient of its extra premium and the Ayrton premium. In 1922 he was elected a member of the council, and has been a vice-president since 1925.

LEWIS PAYNE has been appointed general manager of the Virginia Public Service Company and in addition division manager of the central division, recently organized. The headquarters of the new division will be at Charlottesville.

STEPHEN C. BUNTING, until recently manager of the Mountain district of the New York Power & Light Corporation, has been appointed manager of the Port Henry (N. Y.) Light, Heat & Power Company. He succeeds C. H. Churchill, who was recently appointed vice-president and general manager of the Cortland County Traction Company, also controlled by the Mohawk Hudson Power Corporation System. Since 1921 Mr. Bunting has been connected with the Adirondack staff on the appraisal of its distribution property. He was electrical superintendent at Amsterdam before being appointed manager of the Mountain district. Mr. Bunting is a graduate of Swarthmore College.

Hoover Awarded John Fritz Medal

Herbert Hoover has been awarded the John Fritz gold medal for his distinguished attainments as an engineer, particularly in mining operations. The award was tentatively made a year ago by the John Fritz Medal Board, which is composed of sixteen past-presidents of the four national societies of civil,

Herbert Hoover

mining and metallurgical, mechanical and electrical engineers. By this award, which was unanimous, according to the announcement by Alfred D. Flinn, director of the Engineering Foundation, the board sought to express the high appreciation of Mr. Hoover's professional brethren for his distinguished attainments as an engineer, particularly in mining operations in this and other countries, and his great services as a man to his fellows.

The citation accompanying the award reads: "To Herbert Hoover, engineer, scholar, organizer of relief to war-stricken peoples, public servant." The medal will be presented to Mr. Hoover at the annual meeting of the American Institute of Mining and Metallurgical Engineers in New York next February.

OWEN D. YOUNG, chairman of the board of directors of the General Electric Company, was awarded the honorary degree of doctor of laws by the University of the State of New York. In presenting Mr. Young, Dr. Walter G. Kellogg, regent of the university, referred to him as a "farmer, lawyer, student of books and men, captain of industry, statesman, an international figure, a doer of things, big things." In his address at the convocation Mr. Young discussed the value of research in business.

GEORGE E. HAGGAS, for the past ten years chief engineer of the Cumberland County Power & Light Company, Portland, Me., has been appointed assistant general manager of that property. Mr. Haggas was engaged in valuation engineering in Michigan prior to joining the Portland company, and for three years before being made chief engineer was occupied in that branch of technical activity on the Cumberland County system.

R. M. HORNE-PAYNE has resigned as chairman of the board of directors of the British Columbia Electric Railway, Vancouver, Canada, after 31 years of service. It was through the efforts of Mr. Horne-Payne that the bankrupt street railway systems of Vancouver, Victoria and New Westminster were rehabilitated, financed and extended into the great system of the British Columbia Electric Railway and its subsidiaries of the present time.

ALLEN J. SMITH, who has been general manager of the Texas-Louisiana Power Company, has become vice-president and general manager of it and of its purchaser, the General Waterworks & Electric Corporation, New York City. A. D. McNab, who has been treasurer of the Texas-Louisiana Power Company, has become secretary-treasurer of that corporation and assistant treasurer of the General Waterworks & Electric Corporation.

P. C. HOUGH of the service department of the Black & Decker Manufacturing Company will leave shortly for Australia to establish service facilities for the users of Black & Decker products in Australia and New Zealand.

JOHN A. REICH, formerly chief engineer of the Ponce Electric Company, Ponce, P. R., has been transferred to the Virginia Electric & Power Company. Eldon Tyler has been selected to succeed Mr. Reich. Both these companies are controlled by Stone & Webster, Inc.

FRANK R. FOWLES, manager of the power and light department, Cumberland County Power & Light Company, Portland, Me., has resigned to join the staff of the Old Colony Corporation, Boston, Mass., where he will be occupied in engineering and financial investigations for this banking organization. Mr. Fowles is a past-chairman of the engineering section, New England Division, N.E.L.A., and has headed the power and light department at Portland since 1920. For five years he was general superintendent of the York County Power Company, Biddeford, Me., previously being contract manager of the Tennessee Power Company, Chattanooga, and, earlier, manager of the Chattanooga office of the General Electric Company.

Financial and Statistical News

New International Holding Company Formed

A new holding company has been organized abroad by leading public utility, industrial and banking interests of the United States and several European countries under the name of Trust Financier de Transports et d' Enterprises Industrielles with a capitalization of 100,000,000 francs, represented by 200,000 shares of 500 francs each par value. Daniel Heineman, actively identified with public utility enterprises in Europe and in South America for a number of years, is heading the new organization. Gordon Auchincloss, lawyer of New York, is the only American director of the new company, the board being composed of men prominent in financial circles on the Continent. The American interests participating in the formation of Trust Financier de Transports et d' Enterprises Industrielles as incorporators and subscribers include the Electric Bond & Share Company, the International General Electric Company, Dillon, Read & Company, Bankers Trust Company, Guaranty Company, Kuhn, Loeb & Company, Lee, Higginson & Company, International Acceptance Bank, Inc., and the International Acceptance Trust Company.

International Combustion Shows Gain in Income

A 26 per cent gain is shown in the operating income of the International Combustion Engineering Corporation and subsidiaries for the half-year ended June 30. After all charges, including interest and preferred dividends, net profits were equivalent to $1.01 a share on the common stock. While power plant construction is usually at a low ebb during the first four months of the year, business for the first half year showed a very satisfactory increase and it is anticipated that the second half year will show materially higher earnings than any previous half-year period.

International Combustion Engineering Corporation recently acquired the Hedges - Walsh - Weidner Company, which in turn was a consolidation effected a few months ago of the Casey-Hedges and the Walsh & Weidner Boiler Company. This enables International to offer a forged steel sectional header boiler up to 2,000 lb. of pressure, manufactured in plants under its control. The Walsh & Weidner sectional header boiler is known to be a leader of its type and in conjunction with Combustion's furnaces and equipment for burning coal in powdered form makes a desirable combination for certain installations. Several orders have recently been received for the new type of steam generator, which has been further improved. Considerable interest has been aroused and many active inquiries are being dealt with for this new generator in England and on the Continent.

The company is now actively engaged in the treatment of fuel for power plant use, with the object of recovering the waste volatiles and eliminating smoke from the stacks, at the same time increasing the output of the power plant, thereby reducing the investment cost per unit produced.

The consolidated income account of the company for the six months ended June 30 is as shown in the accompanying table.

	1928	1927
Operating income	$1,527,416	$1,208,094
Other income	90,623	137,742
Total income	$1,618,039	$1,345,836
Depreciation	203,382	155,182
Federal tax reserve	93,592	129,923
Interest, etc.	263,596	118,757
Net profits	$1,057,469	$941,974
Preferred dividends	175,000	.....
Common dividends	874,513	689,501
Subsidiaries' dividends	84	1,860
Surplus	$7,872	$250,613

Every Town of 2,500 Is Served

A recent survey reveals the fact that every incorporated city and town in the United States having, in 1920, a population of 2,500 or more persons is provided with electric service. The census lists 2,787 such places, which constitute what is statistically designated as the urban population of the country, and which comprised 51.4 per cent of the entire population at that time. Moreover, it appears that this service has existed for a number of years.

Bankers Condemn Use of Misleading Terminology for Securities

Believe Utility Industry Has Nothing to Fear if Federal Trade Investigation Is Carried Out Fairly

AN EVEN greater future development than anything on record was predicted for the electric light and power industry by John P. Baer of Baltimore, chairman of the public service securities committee of the Investment Bankers' Association, at its convention in Atlantic City last week. The trend toward mergers was stated in the committee's report to be a desirable trend and one destined to link up isolated plants earning little and giving mediocre service into great interconnected systems.

Relative to the investigation of utilities by the Federal Trade Commission and the questionnaire issued by the latter body, the report on public utility securities states:

Your committee takes the stand that the industry has nothing to fear from a non-political fact-finding investigation and approves all educational work, whether by way of news articles, by way of paid advertisements or by any other fair means, provided the subject matter is presented truthfully and fearlessly.

Your committee feels that the public management can be depended upon to discourage any effort to include in its educational program ambiguous statements or subject matter that may mislead or may convey an incorrect impression. Your committee believes that the utility corporations as a whole are honestly managed, and have been and are one of the forces of primary industry which has made America great, and we feel that if the effort to federalize or nationalize public utilities is successful, a great calamity will have fallen upon this country.

We now reaffirm the position so often taken by the Investment Bankers' Association of America that we are entirely opposed to the entry of the government into business and we feel that, both as to quality and cost of service, the people of this nation are better served under private than under public ownership and we reaffirm our belief in state commission control rather than federal administration.

Criticise Bond Titles

One of the most constructive recommendations brought forward recently by the association was one condemning the use of "equivocal and unfair" titles in connection with bond issues. After attacking the use of misleading bond designations, the sub-committee appointed to look into this subject recommended discontinuance of many terms now being applied. The recommendations were as follows:

1. The passage by the association and publication among its members of resolutions calling the lines of the drafts submitted herewith.

2. The appointment of committee of a permanent character with these functions:

(a) To advise members, upon request, as to the propriety of the titles, the use of which is contemplated.

(b) To call to the attention of member and non-member dealers cases where titles employed by them are susceptible of criticism; and bring to the attention of the business conduct committee any particularly objectionable title.

(c) To co-operate with such agencies of the Association of Securities Commis-

sioners, American Bar Association and American Bankers' Association, as may be created to consider the same problem.

(d) To create by publicity and other measures a pronounced public opinion against the use of equivocal and unfair titles.

The following officers of the association were appointed for the coming year: Rollin A. Wilbur, Herrick Company, Cleveland, president, succeeding Henry R. Hayes, of Stone & Webster and Blodget, Inc., New York; Alden H. Little, Chicago, executive vice-president; Frank M. Gordon, First Trust & Savings Bank, Chicago; Jerome J. Hanauer, Kuhn, Loeb & Co., New York; Joseph L. Seybold, Wells-Dickey Company, Minneapolis; Joseph R. Swan, Guaranty Company, New York, and Carroll J. Waddell, Drexel & Company, Philadelphia, vice-presidents; Robert A. Gardner, Mitchell, Hutchins & Company, Chicago, treasurer; Clayton G. Schray, Chicago, secretary.

Puget Sound Utility to Create New Preferred Stock Issue

At a meeting to be held Nov. 13 stockholders of the Puget Sound Power & Light Company will vote on increasing the authorized capitalization by 300,000 shares of no par value junior preferred stock. A condition of Engineers Public Service Company's obligation to acquire Puget common stock, an acquisition referred to in previous issues of the ELECTRICAL WORLD, is that the Puget Sound company will issue and sell to it for cash at $25 per share these 300,000 shares of junior preferred stock without par value.

August Light and Power Operations Continue Their Climb

Revenue Rises 8.8 per Cent—Energy Output Breaks Record—Is 10.8 per Cent Greater Than a Year Ago—Much Water Power Used

CONTINUING the accelerated rate of growth noted since the beginning of summer, August operations of electric light and power companies in the United States exceeded those of the corresponding month of 1927 by materially greater gains than were recorded earlier in the year. The rise in revenue, 8.8 per cent, almost matched that for July, and exceeded, in terms of percentage, the rise for any other month since September, 1927. The energy output was 10.8 per cent greater than a year ago, breaking both the monthly and the average daily record hitherto established. This rate has not been equaled since the spring of 1927, except in February, and then only because of the extra day.

The returns received by the ELECTRICAL WORLD indicate a total revenue for the whole country of $147,700,000, operating expenses of $67,700,000 and an output of 7,103,010,000 kw.-hr. Of the last named, 2,946,204,000 kw.-hr., or 41.5 per cent, was generated from water-power and 4,156,806,000 kw.-hr. from fuel.

Compared with July, the revenue rose about 0.5 per cent, the energy 5 per cent. The increase in the latter was obtained from fuel; the output of hydraulic plants differed little in the two months. Fuel consumption was greater than in July, but compared with August, 1927, the coal consumption fell by 1.8 per cent to 3,180,358 tons; oil rose 20.3 per cent to 577,641 barrels, and the use of natural gas increased by 21.2 per cent to 7,588,592,000 cu.ft.

The output from hydraulic plants continues to grow at a more rapid rate than that from fuel-burning plants. The year's interval brought an increase of more than 24 per cent in the former with less than 5 per cent in the latter. Energy purchased for resale remains close to 1,300,000,000 kw.-hr. a month.

Analysis of the past growth of the industry, shown in the accompanying chart, affords a basis for comparing actual operations with a computed normal. From such comparison, it is evident that the energy output has been running ahead of the five-year average rate since April, after being slightly subnormal since the preceding October. Similarly, the revenue curve was a little below the estimated normal from the early winter until May, but during the following three months reached it every time. In other words, gaged by the past, the operations are now and have been since early summer fully up to the figures that were to be expected.

Table I—Central-Station Financial Operations for the First Half Year in the United States

(100 Per Cent of the Industry)

Month	Total Gross Revenue from Sale of Energy†			Estimated Distribution of Gross Revenue								Total Operating and Maintenance Expenses‡	
				Lighting Customers		Power Customers		Electric Railways		Other Public Utilities			
	1928 Thousands	1927 Thousands	Per Cent Inc.	1928 Thousands	1927 Thousands	1928 Thousands	1927 Thousands	1928 Thousands	1927 Thousands	1928 Thousands	1927 Thousands	1928 Thousands	1927 Thousands
May....	$150,300	$139,700	+7.6	$83,400	$77,600	$51,100	$46,800	$4,950	$4,650	$10,850	$10,650	$65,700	$63,100
June....	149,500	138,700	+8.2	81,700	75,700	52,100	47,800	4,800	4,400	10,900	10,800	64,800	62,700
July....	146,900	134,300	+9.4	78,700	72,100	52,700	47,250	4,600	4,320	10,900	10,630	65,300	63,400
August...	147,700	135,600	+8.8	79,800	74,800	52,500	47,400	4,460	4,100	10,940	9,300	67,700	65,300

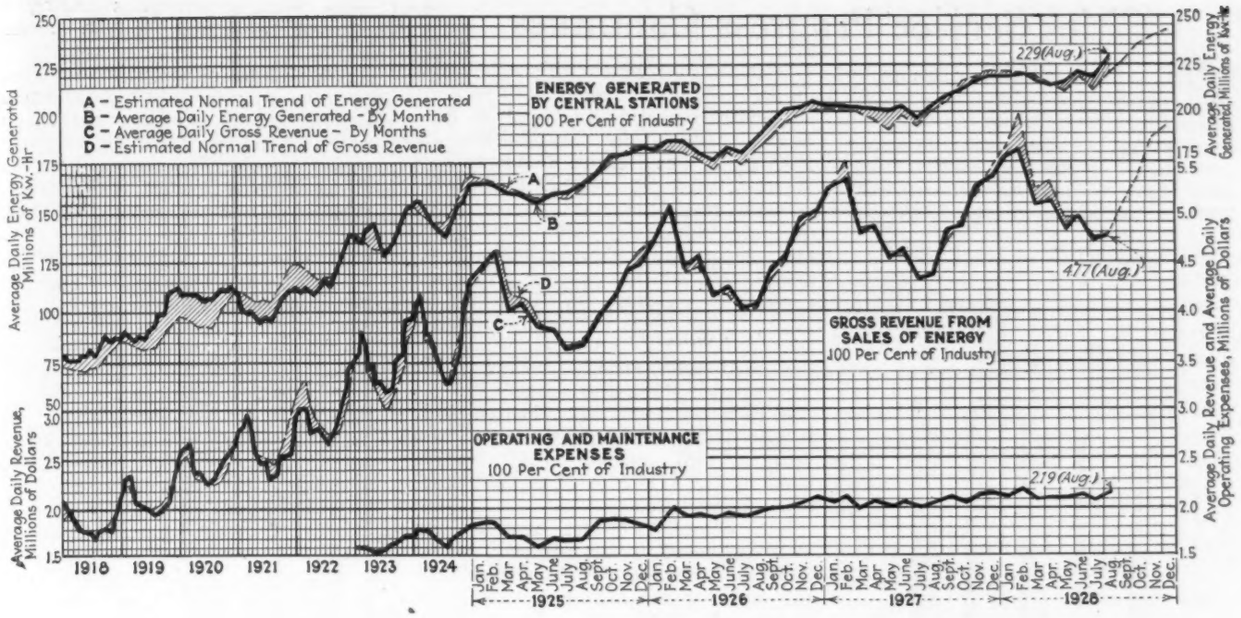
†Aggregate gross revenue from actual consumers, and sales to other public utilities for resale, involving a certain amount of duplication.
‡Do not include interest, taxes, depreciation or sinking fund.

Table II—Generation and Distribution of Central-Station Energy in the United States

(100 Per Cent of the Industry)

Month	Kw.-Hr. Generated Monthly *			Estimated Distribution of Energy Generated										Energy Purchased by Public Utilities for Resale, Kw.-Hr.	
				Total Energy Consumption by Central-Station Customers, Kw.-Hr.		Energy Consumed for Lighting, Kw.-Hr.		Energy Consumed for Power, Kw.-Hr.		Energy Sold to Electric Railways, Kw.-Hr.		Energy Used in Intracompany Business, Including Line Losses, Kw.-Hr.			
	1928 †Thousands	1927 Thousands	Per Cent Inc.	1928 Thousands	1927 Thousands	1928 Thousands	1927 Thousands	1928 Thousands	1927 Thousands	1928 Thousands	1927 Thousands	1928 Thousands	1927 Thousands	1928 Thousands	1927 Thousands
May..	6,721,597	6,218,471	+ 8.1	5,531,597	5,123,471	1,345,000	1,252,000	3,681,597	3,406,471	505,000	465,000	1,190,000	1,095,000	1,256,000	1,252,000
June..	6,637,610	6,127,247	+ 8.3	5,464,610	5,043,247	1,290,000	1,205,000	3,694,610	3,385,247	480,000	453,000	1,173,000	1,084,000	1,244,000	1,228,000
July..	6,759,788	6,109,472	+10.6	5,564,788	5,028,472	1,330,000	1,242,000	3,759,788	3,338,472	475,000	448,000	1,195,000	1,081,000	1,252,000	1,178,000
August	7,103,010	6,335,335	+10.8	5,844,010	5,217,335	1,355,000	1,265,000	4,009,010	3,500,335	480,000	452,000	1,259,000	1,118,000	1,301,000	1,290,000

*Data on "energy generated" are those collected and published by the United States Geological Survey for all public utilities minus such data as are collected on energy generated by electric railway companies, reclamation service and manufacturing plants. The data are, therefore, for the electric light and power industry only.
†1928 figures are only approximately comparable with those for 1927, because of changes in classification of certain plants.


A – Estimated Normal Trend of Energy Generated
B – Average Daily Energy Generated – By Months
C – Average Daily Gross Revenue – By Months
D – Estimated Normal Trend of Gross Revenue
ENERGY GENERATED BY CENTRAL STATIONS
100 Per Cent of Industry
GROSS REVENUE FROM SALES OF ENERGY
100 Per Cent of Industry
OPERATING AND MAINTENANCE EXPENSES
100 Per Cent of Industry
229(Aug.)
477(Aug.)
219(Aug.)
Average Daily Energy Generated, Millions of Kw.-Hr
Average Daily Revenue, Millions of Dollars
Average Daily Revenue and Average Daily Operating Expenses, Millions of Dollars
1918 1919 1920 1921 1922 1923 1924
1925 1926 1927 1928

Further, there are strong indications that a considerable share of the recent growth has been due to industrial power sales; this is significant as a measure of industrial conditions. During summer the lighting component of the load is much smaller than in winter; the increase in energy used, therefore, signifies an even greater increase in industrial power, since other uses grow but slowly and are relatively small. This larger component of heavy power and smaller component of lighting than in winter also accounts for the lower revenue in summer, notwithstanding the larger output.

REGIONAL CHANGES IN REVENUE, AUGUST

Region	Per Cent Increase or Decrease Compared with August, 1927	July, 1928
New England	+4	+1
Atlantic	+10	—1
North Central	+8	+2
South Central	+7	+4
Western	+12	+1

Regionally, the year's revenue increased most in the Rocky Mountain and Pacific States, where it was 12 per cent, and least in New England, with a rise of but 4 per cent. Other parts of the country have come fairly close to the national average, although there are local exceptions. Compared with the revenue in July every region shows an increase except the Atlantic Seaboard States, which report a drop of 1 per cent. Much of this drop occurred in the Metropolitan district, where the same thing happened last August.

Three New Utility Offerings Made

During the week ended Oct. 25, Electric Investors, Inc., issued 25,000 shares of $6 preferred stock at $99 per share and accrued dividends from Nov. 1, 1928, to yield over 6 per cent. Proceeds from the sale of this preferred stock will provide funds for the acquisition of additional interests in electric power and light companies, and for other corporate purposes.

First (closed) mortgage 5 per cent gold bonds of the Bellows Falls Hydro-Electric Corporation were offered to the amount of $9,000,000, the price being 98 and interest, yielding over 5.12 per cent. The Bellows Falls corporation, organized under the laws of Vermont, will be controlled through ownership of all its common stock by the New England Power Association.

The Iowa Public Service Company made an offering of $6 cumulative first preferred stock totaling 7,500 shares at $98 per share and accrued dividend, to yield 6.12 per cent. This company operates in western and north central Iowa.

Georgia Merger in Effect

Formal exchange of Georgia Power Company stock for the outstanding stocks in four utility corporations operating in Macon were effected at a meeting of stockholders of the Georgia Power Company held Oct. 17.

The companies involved in the consolidation are the Macon Railway & Light Company, Central Georgia Power Company, Central Georgia Transmission Company and Georgia Public Service Corporation. Under the merger plans, the outstanding capital stock of the Georgia Power Company will be converted into the same class of stock, share for share, in the consolidated company, and the stock of the four Macon companies involved will be made exchangeable for the new $5 preferred stock of the Georgia Power Company.

The present outstanding stock of the Georgia Power Company is 2,000,000 shares of common stock, 293,000 shares of $6 preferred, 88,000 shares of $5 preferred, 83,000 shares of which will be used in the exchange of stock, and 400,000 shares of second preferred.

ASSOCIATED GAS INCREASES CLASS A STOCK.—Stockholders of the Associated Gas & Electric Company on Oct. 1 increased the authorized class A stock, no par value, from 800,000 shares to 1,000,000 shares.

*Table III—Operations of Central-Station Hydro and Fuel Plants in the United States**

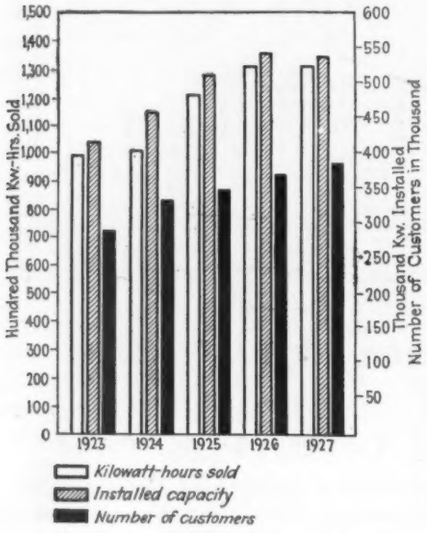
(100 Per Cent of the Industry)

Month	Energy Generated: Hydro-Plants 1928 Thousands of Kw.-Hr.	Hydro-Plants 1927 Thousands of Kw.-Hr.	Hydro-Plants Per Cent Increase	Fuel Power Plants 1928 Thousands of Kw.-Hr.	Fuel Power Plants 1927 Thousands of Kw.-Hr.	Fuel Power Plants Per Cent Increase	Fuel Consumption: Coal 1928 Short Tons	Coal 1927 Short Tons	Coal Per Cent Increase	Oil 1928 Barrels	Oil 1927 Barrels	Oil Per Cent Increase	Gas 1928 Thousands of Cubic Feet	Gas 1927 Thousands of Cubic Feet	Gas Per Cent Increase
May	3,071,603	2,625,427	+17.0	3,649,994	3,593,044	+ 1.6	2,821,472	2,918,935	—3.3	461,485	462,386	— 0.1	5,731,897	4,825,262	+18.8
June	3,010,462	2,491,840	+20.8	3,628,148	3,635,407	— 0.2	2,753,141	2,904,907	—5.2	477,037	453,025	+ 5.5	6,225,493	5,214,762	+19.4
July	2,977,365	2,401,852	+24.0	3,782,423	3,707,620	+2.0	2,875,221	2,996,291	—4.0	520,115	449,903	+15.6	6,962,322	5,598,713	+24.4
August	2,946,204	2,371,572	+24.2	4,156,806	3,963,763	+4.9	3,122,865	3,180,358	—1.8	577,641	480,022	+20.3	7,588,592	6,259,785	+21.2

*As collected by United States Geological Survey. The data are for the electric light and power industry only.

Cities Service Progress Continues

THE success which accompanied Cities Service undertakings in 1927, making that year the most profitable in its history, has continued during the present year if one were to judge from the facility with which this organization has just disposed of a $30,000,000 issue of 5 per cent gold debentures priced at 97½ and interest. These securities carried non-detachable warrants entitling the holder of each $1,000 debenture to purchase, subject to certain indenture provisions, fifteen shares of common stock during the period from Nov. 1, 1928, through Nov. 1, 1931, at prices ranging from $72 to $82 per share. The consolidated capitalization of the company and subsidiaries as of June 30, 1928, after giving effect to this financing, shows outstanding funded debt, preferred stocks and minority common stocks of subsidiaries amounting to $371,530,178 and equipment trust certificates totaling $2,030,000 and funded debt of the company amounting to $100,591,500, which will be followed by preferred and common stock with an aggregate market value based on current quotations of over $450,000,000. In 1927 the Cities Service Company had the most successful year in its history, reaching new high marks in both production and earnings. Net earnings of the company and its subsidiaries were $60,117,992, an increase of nearly 30 per cent over earnings of $46,306,907 in 1926. Total assets of the organization advanced in 1927 to $809,036,357, as compared with $663,128,487 in 1926. The balance sheet also shows $29,485,484 cash on hand, as compared with $24,505,843 at the close of the previous year. Total surplus and reserves amounted to $118,756,742, against $87,695,015 for 1926.

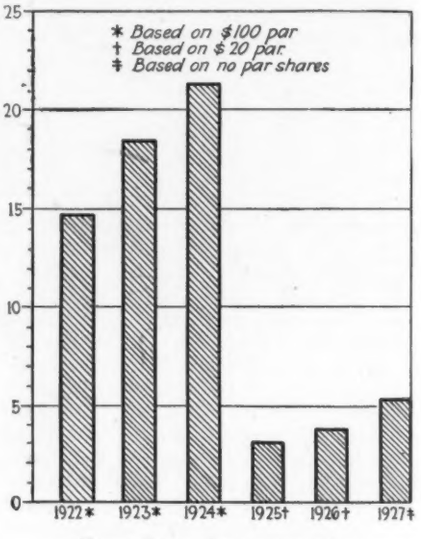


Operating statistics of Cities Service show consistent growth

The consolidated net earnings for 1927 amounted to 9.44 per cent on the total capitalization and funded debt of the company and subsidiaries, as compared with 8.48 per cent in 1926. The net earnings of the Cities Service Company alone for 1927 were equivalent to 12.58 times interest and discount on bonded indebtedness. The excellent earning record was continued during 1928, according to the statement just issued for the month of September and for the year ended Sept. 30. The net earnings totaled $32,529,413 for the twelve months ended Sept. 30, 1928, as compared with $30,588,203 for the year ended Sept. 30, 1927. For this same period the per cent on average amount of common stock outstanding amounted to 24.61 per cent, as compared with 26.13.

The company was incorporated in 1910 to acquire and hold the securities of electric light and power, natural and artificial gas, steam heating, water, electric street and interurban railways and other public utility corporations. At the present time the company controls directly or indirectly through stock ownership more than 60 public utility companies rendering electric light, power, gas and transportation service in eighteen states and the Dominion of Canada, serving territories having a population estimated to be about 4,000,000.

A compilation of operating statistics shows a steady growth in kilowatt-hours sold. In 1922 this item was recorded as 862,066,092 and by 1925 it had advanced to the 1,212,541,098 mark, and at the close of 1927 it totaled 1,307,719,522. A glance at the accompanying chart will show the consistent growth in customers, from 289,628 in 1923 to 381,852 in 1927.



Earned per share common since 1922

The history of the common stock of the Cities Service Company is exceptionally interesting. Originally a hundred dollar par value stock, it was changed to a twenty dollar par value stock in 1925, five year shares being issued for each old share, and again last year the value of the stock was changed to no par shares. The following table shows the price range from 1923:

1923	1924	1925*	1926	1927	1928
195-128	190-132	43-35	51-37½	58¼-40¼	72¼-54

* New stock.

Current Earnings Reports of Electric Light and Power Companies

	1928	1927	Per Cent Increase	Operating Ratio 1928	Operating Ratio 1927
American Water Works & Electric & Subs. (Year ended Aug. 31)					
Gross earnings	$50,134,315	$47,956,261	4.5	52	52
Net earnings	24,029,819	23,009,696	4.4	..	..
Cities Service (Year ended Sept. 30)					
Gross earnings	33,670,218	31,687,049	6.3	..	..
Net earnings	32,529,413	30,588,203	6.4	..	..
Detroit Edison (Nine months ended Sept. 30)					
Gross earnings	37,806,645	34,511,719	9.5	..	..
Net earnings	12,740,298	10,540,999	20.8	..	..
Engineers Public Service & Subs. (Year ended Aug. 31)					
Gross earnings	30,700,381	28,780,338	6.7	59	62
Net earnings	12,424,212	11,055,671	12.3	..	..
Federal Light & Traction (Year ended Aug. 31)					
Gross earnings	7,586,997	6,894,482	10.0	60	60
Net earnings	2,993,828	2,709,122	10.5	..	..
Illinois Power & Light & Subs. (Year ended Aug. 31)					
Gross earnings	33,413,137	31,569,339	5.8	57	60
Net earnings	14,138,354	12,465,406	13.6	..	..
Los Angeles Gas & Electric (Year ended Aug. 31)					
Gross earnings	$21,633,205	$20,848,820	3.7	55	54
Net earnings	9,720,514	9,587,096	13.9	..	..
New Orleans Public Service (Year ended July 31)					
Gross earnings	18,585,988	18,103,932	2.7	62	62
Net earnings	7,121,040	6,752,401	5.4	..	..
Texas Power & Light (Year ended Aug. 31)					
Gross earnings	9,507,484	9,025,238	5.0	54	56
Net earnings	4,345,053	3,982,480	9.0	..	..
United Light & Power & Subs. (Year ended Aug. 31)					
Gross earnings	88,884,826	81,901,239	8.5	66	68
Net earnings	30,020,073	25,709,382	10.7	..	..
Utah Power & Light (Year ended Aug. 31)					
Gross earnings	10,859,939	10,628,780	2.0	49	48
Net earnings	5,536,569	5,569,802	1.0	..	..
West Penn Electric (Year ended Aug. 31)					
Gross earnings	37,654,985	36,684,400	2.6	..	..
Net earnings	17,085,337	16,667,607	2.5	..	..

Business News and Market Conditions

Record Productive Activity

Electrical Manufacturing Plants Increase Operations by 12 per Cent Over Last Year—Nine Months' Production 5.9 per Cent Over Last Year

A NEW record for average daily productive operations was hung up during September by the manufacturing plants of the nation as indicated by reports of monthly consumption of electrical energy by these plants received by ELECTRICAL WORLD. September operations, after corrections are made for the number of working days, were 17.6 per cent over August, 12 per cent over September and 7 per cent over the previous high record of productivity recorded in October last year. That the total volume of production for the full year by the electrical manufacturing plants of the nation will exceed that of last year by several per cent is indicated by the fact that the average operations of these plants during the first nine months of the current year were 5.7 per cent above that during the same period last year. This is about the average annual rate of growth recorded by the industry during the past five years. Last year the industry was exceeding the same month of the previous year during the first half of the year and operating at about the same rate during the last half of the year. During the current year, however, the first quarter did not record a gain over the same months last year, while during the second and third quarters the rate of operations was actually above last year, and there is every indication that the last quarter will also witness operations on a plane materially above the same period last year.

The gain recorded during September by the larger electrical manufacturing plants was less than that reported for the group of smaller plants. The September rate of operations in the smaller plants as a group was 20 per cent above August and 14 per cent above September last year, while the group of larger plants reported an increase during September of only 1 per cent above August and 9 per cent above September last year.

The index of activity in the electrical manufacturing industry based on the consumption of electrical energy stands at 140.5 for September, as compared with 119.4 for August and 125.4 for September last year. Comparative indexes of productive activity, referred to the period 1923-25 as 100 and adjusted for the number of working days, are as shown in the accompanying table.

September, 1928	140.5
August, 1928	119.4
July, 1928	120.8
September, 1927	125.4
November, 1927 (former peak month)	131.3
Average first nine months 1928	123.3
Average first nine months 1927	116.4

Steel Production Sets New High Record

Steel production for September set a new high record, being 10 per cent above that for any previous September. Unfilled tonnage of the United States Steel Corporation showed a slight decrease last week from its high rate of early October.

Until this year the heaviest August and September production of steel was in 1926. This year these months showed 6 per cent more production, representing about 500,000 tons of steel ingots. The automobile industry accounts for fully one-fourth of this increase. Fabricated structural steel construction probably accounts for another fourth and agricultural implement manufacture accounts for an important part of the other half of the increase.

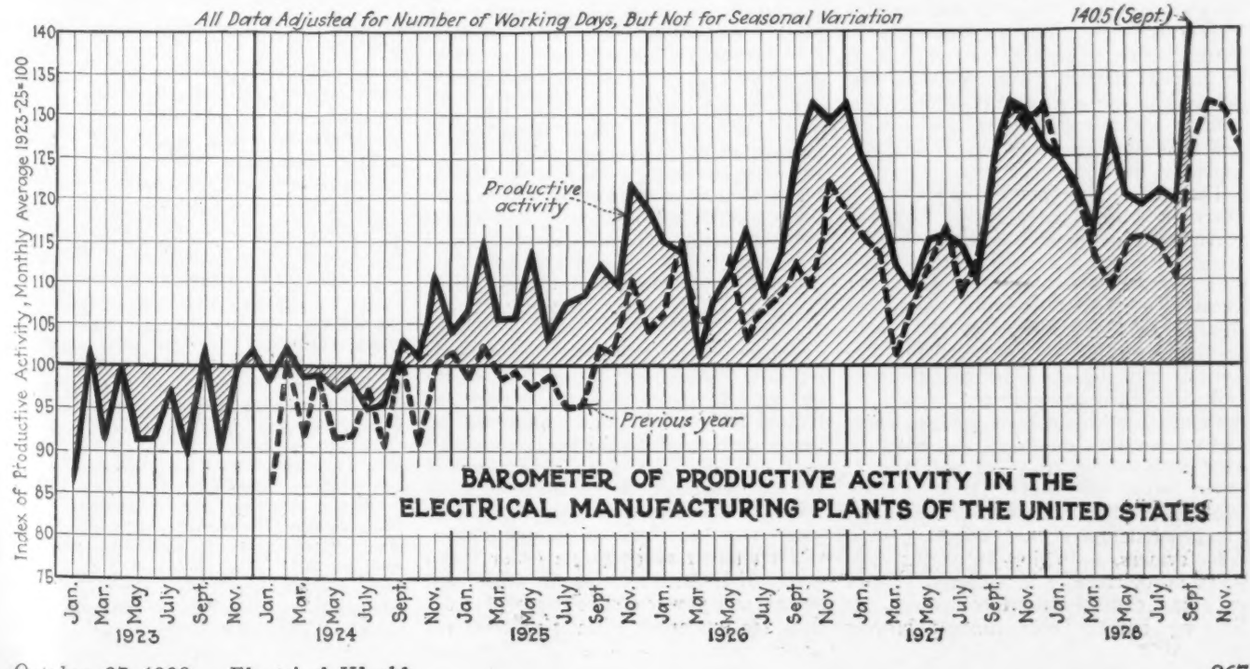
Copper Price Advanced

Copper, which has occupied the center of the non-ferrous-metal market stage so much in recent months, returned to a dominating position during the week ended Wednesday, which followed several weeks of subnormal buying earlier this month. With export business again in large volume and domestic consumers begging for the metal for any delivery, an advance in price to 15½ cents per pound has been recorded. Lead buying continued in slighter better than average volume at unchanged prices.

NEW YORK METAL MARKET PRICES

	Oct. 17, 1928 Cents per Pound	Oct. 24, 1928 Cents per Pound
Copper, electrolytic	15.25	15.50
Lead, Am. S. & R. price	6.50	6.50
Antimony	11	10⅞
Nickel, ingot	35	35
Zinc, spot	6.60	6.60
Tin, Straits	48.75	48.50
Aluminum, 99 per cent	24.30	24.30

Base copper wire price Oct. 24, 1928, 17¼ cents.



Market Conditions

WHILE there seems to be a temporary lull in central-station business in the Eastern district, industrial buying has taken the center of the stage. This is due largely to extensions to large manufacturing plants. In New England and in the Southeast small orders continue to dominate, but in the New England district negotiations are under way for certain heavy industrial equipment.

Industrial buying looms large in the Middle West also, and the outlook for new business during the balance of the year is regarded as being exceedingly bright. Business in the St. Louis district is satisfactory, but more or less featureless.

Keen activity in several branches of the trade is reported from the Pacific Coast. Machinery and power apparatus sales are very substantial and the general building program is being sustained at a high level.

Industrial Business Active in Eastern District

Industrial account carries a firm and steady tone in the Eastern district, with incoming inquiries for early future commitments developing to an encouraging extent. Motors for industrial service continue active under an expanding market, brought about largely through plant extensions in several lines, including automobiles, metals, rubber and cement. Four automobile companies in Michigan will expend $5,000,000 for plant expansions; a rubber company at Akron, Ohio, plans additions to cost approximately $1,000,000, while another such mill in the same city will carry out expansions to an amount of $5,000,000; a cement mill is projected in Kentucky to cost $1,500,000, and another cement project in Texas is estimated at $1,000,000; an aluminum company in Pennsylvania will carry out expansions to cost $1,200,000. Accompanying the demand for motors, there is an improved call for control equipment and metropolitan business in this line is developing to a satisfactory extent.

Fractional-horsepower motors and other units are securing good attention, particularly in connection with refrigerating, oil burning, sewing machines and sign service. Motors for ventilating purposes and for washing machines show a tendency to low levels. Substation apparatus for industrial installations is showing up better and the outlook carries encouragement.

Central-station business holds uniform and on a rather unsatisfactory level, at least with respect to prime movers and other major machinery. Miscellaneous equipment shows signs of active revival, particularly in connection with transformers, switching apparatus, network protectors and meters. Metropolitan central-station companies are limiting current commitments largely to replacement equipment. Wire and cable business continues to show fair strength, with inquiries increasing. A manufacturer of wiring devices reports business as a little spotty, with inquiries subnormal and the outlook not very bright for immediate demand. Street-lighting equipment is engaging under an expanding market, and floodlighting systems for airport installations are developing good business. Construction activities are as follows:

The Miller Parlor Frame Company, Brooklyn, plans a factory to cost $150,000. The American Can Company, New York, will build an addition to its plant at Montreal, Que., to cost $200,000. The Fairchild Aviation Corporation, New York, will build an aircraft manufacturing plant near Montreal, Que., to cost $100,000. The American Telephone & Telegraph Company, New York, has authorized a fund of $11,042,000 for the construction of long-distance facilities. The Utah Copper Company, New York, will build a copper leaching plant at Bingham, Utah, to cost $250,000. The Jersey Central Power & Light Company, Asbury Park, N. J., plans a steam-operated electric power plant at South Amboy, N. J., to cost $500,000. The Warren Pipe & Foundry Company, Phillipsburg, N. J., plans a plant at Everett, Mass., to cost $100,000. The DeLaval Steam Turbine Company, Trenton, N. J., plans an addition to cost $100,000.

The United Globe Knitting Mills, Inc., Philadelphia, plan a mill to cost $100,000. The Atwater Kent Manufacturing Company, Philadelphia, will expend $1,000,000, for an addition instead of smaller sum recently noted in these columns. The Union Battery Company, Philadelphia, plans a factory to cost $80,000. Boger & Crawford, Philadelphia, will build an addition to its power plant at its textile mill to cost $40,000. The Aluminum Company of America, Inc., Pittsburgh, will build an addition to its plant at New Kensington, Pa., to cost $1,200,000. The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., plans a radio experimental plant near Wilkinsburg, Pa. The Maryland Creamery Company, Baltimore, plans an addition to its ice cream plant to cost $175,000. The Chief of Engineers, United States Army, Washington, will receive bids until Nov. 7 for two 75-kw. motor-generator sets, alternating current and direct current, respectively; two automatic starting compsensators, two substation switchboards, three transformers and four switchboard panels (Circular 2).

Small Orders Numerous in New England Buying

An encouraging activity in buying is reported throughout the New England district, though orders as a rule are limited to small lots. Negotiations for heavy industrial equipment are under way and inquiries are being received for new power plans. Small motors are selling and orders amounting to $45,000 were received by one manufacturer, while another records one order for a group of 150 and another for 60. Small switch and power control apparatus orders are numerous. Manufacturers report a steady fall demand up to very recently, with a likelihood of a falling off in orders during the next few weeks, but, on the other hand, inquiries for future plans are numerous. Central-station supplies are in fair demand. Insulator sales have been heavy recently; outside circuit breaker equipment amounting to $2,000 was noted by one manufacturer and two cars of pipe and many orders for new building construction purposes are of interest. Electric heating furnaces are attracting attention and recently three electric heating pot furnaces were placed in eastern Massachusetts. Construction projects are as follows:

The Hampshire Electric Company, Chesterfield, Mass., plans a transmission line to West Chesterfield, Mass., to cost $25,000. Swift & Company, Chicago, will build a meat plant with refrigerating department at Malden, Mass., to cost $90,000. The Moth Aircraft Corporation, New York, plans a plant at Willimansett, Mass., to cost $75,000.

Miscellaneous Orders Reported in Southeast

Little change is noted in activities in the Southeast. One central station ordered seven-strand steel wire amounting to $6,000 and some other central-station orders were for house type meters totaling $3,000 and creosoted pine poles costing $2,800. One of the smaller and newer power companies in the territory ordered pole-line and house-wiring materials aggregating $4,000.

Two mine locomotives costing $8,000 were ordered by a plant in Alabama and a cotton mill in the same state ordered $3,000 worth of house type meters for installation in the mill village. A contract has been let for a new ice plant in Georgia which will require 140 hp. in motors and $1,000 of wiring materials, while a contract for an asphalt mixing plant requiring 175 hp. in motors and $1,500 in wiring supplies is in immediate prospect. One cotton mill in Georgia ordered three 150-kva. transformers and another cotton mill in the same state purchased mill construction materials amounting to $1,500. Contracts are to be let shortly on a cotton mill addition in South Carolina and a new cotton mill in Tennessee, which jobs will require, respectively, $50,000 and $40,000 in electrical materials. A building permit was issued for a new office building in Atlanta which will cost $700,000. Construction projects are as follows:

The Adamston Flat Glass Company, Clarksburg, W. Va., plans improvements to cost $500,000. The Pillsbury Flour Mills Company, Minneapolis, Minn., plans a mill at Wellsburg, W. Va., to cost $160,000. The Quartermaster Department, United States Army, Fort Thomas, Ky., will receive bids until Nov. 12 for electrical supplies (Circular 57). The Kentucky Cement Corporation, Frankfort, Ky., plans a mill near the city to cost $1,500,000. The Etowah Power Company, Etowah, Tenn., plans extensions in its plant and system to cost $60,000. The Belmont Ice & Fuel Company, Belmont, N. C., will build an addition to cost $40,000. Blacksburg, S. C., plans an automatic traffic signal system.

The Mississippi Power & Light Company, Jackson, Miss., will install an improved street-lighting system at Tylertown, Miss. The Avondale Mills, Sylacauga, Ala., will build an addition to cost $100,000. The Georgia Power Company, Atlanta, Ga., plans an ornamental lighting system at Rome, Ga. The Georgia Power & Light Company, Valdosta, Ga., plans a transmission line to Hoboken, Atkinson, Waynesville, Ga., and vicinity.

Business Increasing in Middle West

The volume of business is steadily increasing in the Middle West and indications point to a continuation up to the close of the year. Industrial activity is increasing, with a large amount of seasonal activity noticeable, and car loadings are high with a varied list of commodities. The steel industry is in excellent shape, while production in the automotive centers is being increased. Reports from agricultural districts indicate a favorable condition and the coal industry shows improvement. Utility companies are active with line extension work and with the correction of overload conditions. Among the interesting orders placed were 159 600-amp., 66 800-amp., twelve 1,600-amp., 15-kv. S.P.S.T. wheel-mounted, solenoid-operated oil circuit breakers, twelve 333-kva. O.I.S.C. 12,000-volt, single-phase transformers, four 667-kva. O.I.W.C. 12,000-volt, single-phase transformers, 1,425 Thompson meters, 5 to 2,000 amp. capacity, and 4,000 5-amp. watt-hour meters and "Mazda" lamps valued at $200,000. Better business conditions are reflected in the increased business for the jobber. Construction projects are as follows:

The Nash Motors Company, Racine, Wis., plans an addition to cost $100,000. The Nichols & Shepard Company, Battle Creek, Mich., will build an addition to its harvesting machine plant to cost $500,000. The Chevrolet Motor Company, Detroit, plans a power plant addition to cost $80,000. The Heywood Starter Company, Detroit, plans an expansion at its aircraft motor starter plant to cost $100,000. The Campbell, Wyant & Cannon Foundry Company, Muskegon Heights, Mich., will build an addition to cost $500,000. The Caspers Tin Plate Company, Chicago, plans a plant to cost $100,000. The Club Aluminum Company, Chicago, plans an addition to cost $100,000. The Electric Household Utilities Company, Cicero, Ill., plans a plant to cost $100,000. The Allis-Chalmers Company, West Allis, Wis., plans a tractor manufacturing plant at Springfield, Ill., to cost $100,000. The Graham-Paige Motor Company, Evansville, Ind., will build a power plant at its automobile body plant to cost $70,000. The Diamond Chain & Manufacturing Company, Indianapolis, Ind., plans an addition to cost $140,000. Indianapolis, Ind., plans a power plant at the city hospital to cost $400,000. The B. F. Goodrich Company, Akron, Ohio, will build an addition to its Canadian mill at Kitchener, Ont., to cost $200,000. The Goodyear Tire & Rubber Company, Akron, Ohio, plans expansions including plant additions to cost $5,000,000. The Central West Public Service Company, Omaha, Neb., plans a transmission line from the power plant at White River to Chamberlain, S. D. The Timber Lake Lighting Company, Timber Lake, S. D., plans extensions in its power plant. The Minnesota Power & Light Company, Duluth, Minn., plans an ornamental lighting system at Little Falls, Minn. The Minneapolis Threshing Machine Company, Hopkins, Minn., will build an addition to cost $100,000. St. Barnabas Hospital, Minneapolis, Minn., will soon take bids for a power plant and mechanical laundry to cost $200,000. New Ulm, Minn., Madison, Wis., and Mount Prospect, Ill., plan ornamental lighting systems. St. Charles, Minn., plans an ornamental lighting system and distributing lines to cost $35,000. The Iowa-Nebraska Light & Power Company, Lincoln, Neb., will install an ornamental lighting system at Avoca, Iowa, to cost $30,000, and will build a transmission line from Humphrey to Cornlea, Neb. Ponca, Neb., plans a municipal light and power plant. Marengo, Iowa, plans a municipal power plant to cost $100,000. The council has provided $100,000 to pay for a new 1,000-hp. boiler, stokers and other equipment to be used in enlarging the Columbus, Ohio, municipal light plant.

Industrial Ordering Active on Pacific Coast

Machinery and power apparatus is the outstanding business on the Pacific Coast, including three Duplex oil well drilling motors valued at $3,500, several reconditioned General Electric locomotives bought by the city of San Francisco for wonk on its Hetch Hetchy system near Livermore, Calif., and charging sets and other accessories for the same valued at $12,500. Shrewd observers predict much machinery business during the next two months, particularly for industrials, because industrial engineers are busy on plant layouts and additions. Prospective business includes a $400,000 power plant for the University of California at Berkeley, a $2,500,000 general headquarters building for the Richfield Oil Company at Los Angeles, a $1,000,000 Jewish community center and a $750,000 apartment house for San Francisco. The radio business is featured by the purchase of a 5-kw. Western Electric broadcasting equipment by station KPO of San Francisco. Another outstanding radio order is the installation of the first unit of loud speakers by the Hotel Sir Francis Drake of San Francisco, which plans to equip every one of its 500 guest rooms.

Power company, railroad and state business is all very quiet, the outstanding power company order covering $4,000 worth of 15-kv., 500,000-circ.mil triplex cable for underground service. A dredging company bought two carloads of 8-in., 30-ft. poles and line material, a lumber company 200 assorted poles of mainly 5-in. 20-ft. with line material, a power company two carloads of 50-ft. poles for Fresno and an Alaskan railroad one large case of No. 4 bare copper wire.

It is reported that specifications are being written by Stone & Webster engineers for electrical apparatus for the initial five-million-dollar unit of the proposed twenty-five-million-dollar steam plant under construction in Seattle for the Puget Sound Power & Light Company and awards are expected to be made not later than the first of the year.

Sales of small motors to eastern Washington apple districts and to lumber mills in the Puget Sound section showed further increases. Sales of two 100-hp. machines to a lumber mill at Olympia, three 500- and five 200-kva. transformers for a cement mill in the Spokane district and one 1,500-kw. and one 600-kw. generator are reported. Street lighting systems are being planned at Renton, Walla Walla, Yakima and Mount Vernon and Vancouver, Wash. Construction projects are as follows:

Joseph Kreutzer and associates, care of the Austin Company, Los Angeles, plan an airport with shops and flood lighting system to cost $300,000. The R. N. Nason Paint Company, San Francisco, plans a factory addition to cost $100,000. Turlock, Calif., will receive bids until Dec. 4 for automatic electric control equipment and accessories for municipal pumping plants. The Bureau of Reclamation, Denver, Colo., will receive bids until Nov. 2 for gates and hoists for the Harper diversion dam, Vale project, Ore. (Specification 481). The Union Oil Company, Bellingham, Wash., plans an oil storage and distributing plant to cost $125,000. The Puget Sound Glass Company, Anacortes, Wash., plans a plant at Seattle, Wash., to cost $200,000. The Mendota Coal & Coke Company, Mendota, Wash., plans a coal byproducts and reduction plant to cost $400,000. The Pacific Coast Cement Company, Seattle, Wash., plans additions to cost $250,000. The Utah Power & Light Company, Salt Lake City, Utah, will install an improved street-lighting system at Shelley, Idaho. Los Angeles, Upland, Monrovia, Pomona, Glendale, Oakland, Long Beach and Richmond, Calif., and Yuma, Ariz., plan ornamental lighting systems. Provo, Utah., plans an ornamental lighting system.

St. Louis Reports Average Sales Volume

There has been no perceptible change in general business conditions in the St. Louis district. One contract for electrical equipment of an industrial concern on the east side of the Mississippi River, including a 6,000-kw. motor-generator set, three 333-kva. transformers with switchboard and switching apparatus amounting to $85,000, was closed. Sales of stock sizes of motors and transformers have held up to previous reports. There has been a good demand for radio sets. Household appliances have not been moving so strong, but shipments of conduit fittings and wire have been good and steady. Construction projects are as follows:

The Cudahy Packing Company, Chicago, plans an addition to its meat packing plant at Kansas City, Mo., to cost $100,000. N. O. Nelson Manufacturing Company, St. Louis, plans an addition to its plumbing equipment plant to cost $290,000. The St. Louis Air Transport & Terminal Company, St. Louis, plans an airport with shops and flood lighting system to cost $400,000. Belleville, Kan., plans an 11-mile transmission line. The American Eagle Aircraft Corporation, Kansas City, Mo., plans a plant at Kansas City, Kan., to cost $500,000. Robert H. Kittelberger, Hot Springs, Ark., and associates will build a baking plant to cost $110,000. The Shreveport Oil & Refining Company, Shreveport, La., plans a plant at New Orleans, La., to cost $650,000.

Activities of the Trade

Congressional Medal for Edison

The beginning of the golden jubilee year of the incandescent lamp was commemorated last week when a special Congressional gold medal was conferred upon Thomas A. Edison. The medal was conferred by Secretary of the Treasury Andrew W. Mellon and the ceremony, broadcast by radio, included an address by the President of the United States on the significance of this invention. The incandescent lamp is generally appreciated as Edison's biggest contribution to the national welfare and wealth, and he himself once described it as "the most satisfactory of my inventions to contemplate."

General Electric Sales Near Half-Billion Mark

The business of the General Electric Company is expanding at a rate that justifies the belief that it will attain this year the unprecedented figure of $340,000,000, according to Vice-President John G. Barry in an address before the Schenectady Rotary Club. Mr. Barry looks forward to sales aggregating $500,000,00 a year in the near future. He said that business in all departments is good, especially so in the radio and refrigeration departments, in which 4,500 people are employed in Schenectady. Mr. Barry said that the two departments will do a business amounting to $60,000,000 this year. The company is now employing in all its plants a total of from 75,000 to 77,000 persons, and of this number about 22,000 are working in Schenectady.

Westinghouse Student Course

This year 3,500 college seniors were interviewed by several Westinghouse educational representatives and 1,900 applied for the graduate student course. Of the total number of applicants 260 men were accepted for the course offered by the Westinghouse Electric & Manufacturing Company.

Along with the graduate student course, the company offers other training courses. Forty college graduates were employed by the company as testers and 25 students were accepted for training in the junior graduate course offered during the summer months. In the two-year intermediate course, open to high school graduates, 33 men have enrolled this summer.

Every year the company trains a few men from foreign countries in order that all of the offices of the company may have men who are familiar with the organization and operation of the parent company. Thirteen foreign students representing twelve colleges in nine countries were given an opportunity of becoming acquainted with American manufacturing customs through the international student course. Australia, the country farthest away, has four representatives, the most from any one country in the international course.

Diamond Chain Takes Over Clark Flexible Coupling

The Diamond Chain & Manufacturing Company, Indianapolis, Ind., has completed arrangements with the I. H. Dexter Company, Goshen, N. Y., for the manufacture and marketing of the Clark flexible coupling. This coupling, made and sold for the past fifteen years by the Dexter Company, is of simple construction and easily installed.

British-Sangamo Company Builds New Plant

The British-Sangamo Company, Ltd., has outgrown its plant at Ponders End, which was built in 1920, and is now building a splendid new plant at Enfield, which is only 2 miles west of the present plant and about 12 miles north of London. The new plant will be of reinforced concrete and will furnish 32,000 sq.ft. of modern manufacturing floor space. There is plenty of land and the plans are made to provide for future expansion. The total investment in the British plant when completed will run to about $400,000.

With this new plant in operation the British-Sangamo Company will have the finest meter manufacturing plant in Great Britain. It is expected that the new plant will be completed April 1, 1929. In the present plant approximately 400 meters per day are being manufactured and the outlook for 1929 is that the total production will run to over 100,000 meters.

Electric Industry Holds Exposition

Wide Range of Appliances and Equipment Displayed—Some Interesting Novelties are Introduced

OCCUPYING three floors of the brilliantly illuminated Grand Central Palace, the annual New York Electrical and Industrial Exposition is this week displaying its ever-widening range of electrical products. The show was opened this year to dealers and members of the industry three days before it was thrown open to the public. It was featured as a National Trade Show, the first to be held in the electrical appliance industry.

Probably greater interest than usual centered this year on electro-therapeutic devices. The New York Edison Company's display of these products included a complete range of ultra-violet rays and carbon arc lamps, electric baths, vibrators, magnetic rejuvenators and similar equipment. The electric camel attracted much interest.

Among the labor-saving devices were a number of washing machines and ironing machines of various types and makes. There are also necktie-pressing machines and an appliance which is said to cook three or four times as rapidly as is ordinarily possible. The use of the ordinary bathtub with a special attachment for washing machine purposes was demonstrated.

One of the striking features of the exposition is the revolving six-room house, which is so arranged that the observer can see every room as it revolves. Each room is elaborately equipped with the proper electrical devices, from the toaster in the kitchen to the electrical health machines in the bathroom.

Electric trucks on display range from huge 10-ton carriers, used for coal and other heavy hauling, down to little red roadsters for children and for grownups to drive about country clubs and similar places. Also on display are the fashionable new delivery trucks, which look like handsome limousines, now being used by New York department stores.

In the center of the first floor and rising to the top of the mezzanine is a 43-ft. tower of modernistic design, which helps call attention to a well-known make of electric refrigerator. This striking tower has a frosted silver and black color scheme, with a refrigerator at the top.

Visitors were able to witness the broadcasting of radio programs over station WRNY from a glass studio in the exposition and also to hear them through amplifiers located outside. In an address delivered over this station James H. McGraw paid a tribute to the appliance manufacturing industry for the notable progress which it has made in recent years in improving the design and beauty of household equipment. Early years were naturally devoted to developing the mechanical ingenuity of this equipment and improving the effectiveness of its service. Now evolution centers on design, finish and the introduction of color and is greatly strengthening the popular appeal of these products. This trend was conspicuously evidenced in the exposition itself, for the employment of color and design in the individual exhibits surpassed all previous years.

THE SUNLIGHT ELECTRICAL MANUFACTURING COMPANY, Warren, Ohio, has appointed C. C. Leininger as general sales manager. He will assume charge of the extensive sales activity, in connection with Sunlight's new magnetic induction motor, and will build up a larger sales staff.

New Equipment Available

Announces Improved Insulator

An engineering improvement in insulators of great importance to the central-station industry is claimed by the Westinghouse Electric & Manufacturing Company. This improvement is the application of a metallic glaze to the line

and tie wire grooves which is designed to reduce interference in radio reception from the insulators.

In isolated cases insulators have been charged with causing radio interference. As the line and tie wire form poor contact with the insulator, a high resistance is presented to the charging current entering the insulator and this sometimes results in minute arcs. The metallic glaze due to its intimate connection with the porcelain is designed to allow the charging current to enter the insulator without arcing.

Electric Arc-Welded Racks

A new line of electric arc-welded secondary racks for which exceptional strength is claimed has been developed by the Line Material Company. The frame is of heavy galvanized steel, pressed into flanged channel form, with side slots which will accommodate up to ½-in. lag screws, and ⅛-in. slots at top and bottom will accommodate a ⅝-in. lag screw. The trussed design steel supports for the insulators are securely electric arc welded to the frame so they cannot pull loose. These supports extend the entire depth of the channel so as to insure great rigidity to the entire structure. For this design several advantages are claimed, such as the elimination of distortion due to line strains; enough vertical play between supports and the porcelain insulators to prevent possibility of pinching the wire in stringing; all metal parts are hot dipped galvanized. Through-rods are ⅝-in. in diameter. The company makes two lines of these racks of this construction, which are known as the 21,000 line for light service and the 23,000 line for heavy service. All construction features are the same for both the heavy and light service.

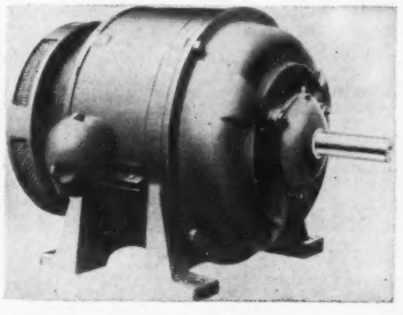
Magnetic Induction Motor

The Sunlight Electrical Manufacturing Company of Warren, Ohio, announces a new split-phase motor called the Sunlight magnetic induction motor. According to J. B. Estabrook, general manager of the company, the performance of the new motor comes well within the requirements laid down by the fractional horsepower committee of the N.E.L.A., which some months ago specified the characteristics of motors best suited to the requirements of public utility operations.

Magnetic clutch action of the new motor is controlled by a centrifugal switch. When starting, the rotor runs free on its shaft. After three-quarter speed has been attained the clutch is automatically "thrown in" and power applied to the motor shaft. If the motor becomes overloaded, its slackened speed causes the clutch to disengage and engage again repeatedly. When stalling becomes imminent, the clutch is disengaged entirely. The highest point of operating efficiency is thus constantly maintained and dangerous wear and tear due to overloading and overheating are prevented. Since the motor does not pick up its load until running at three-quarter full speed, only a low inrush of starting current is required. Since the necessary starting current volume is greatly reduced, and heavy overloading currents eliminated, added protection is afforded the starting windings. An 8-amp. fuse is sufficient to operate one of the ¼-hp. models.

Skeleton Frame Motors

The Reliance Electric & Engineering Company is showing a new skeleton frame motor with exhaust type fan as



illustrated. In motors of this type used for larger ratings a single exhaust type fan is mounted on an extension of the shaft outside the front bearing bracket.

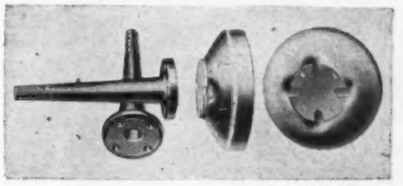
Meter Testing Switch

A meter testing switch for use with current or potential transformers, 30 amp., 250 volts, is announced by the Trumbull Electric Manufacturing Company. The device consists of a slate base test block inclosed in a steel cabinet. The top end of the cabinet is equipped with a shutter containing knockouts for all standardized meters.

The test block itself consists of three single-pole switches which control the current to the potential coils of the meter and two double-pole switches which control the current to the current coils of the meter. The latter switches have an auxiliary jaw by which the current transformer is short circuited when the switch is open.

Interchangeable Insulator Unit

The accompanying illustration shows a new interchangeable insulator unit with forged steel pin made by the Rail-



way & Industrial Engineering Company. Test figures on the unit are said to show higher strengths in cantilever and torsion than heretofore obtained. Slotted holes are provided to prevent corrosion at this point.

Armored Cable

Flexsteel armored cable and lamp cord as announced by the National Electric Products Corporation possesses unusual features designed for mechanical protection of conductors, flexibility, long service and economy. The conductors, which have individual insulation meeting code specifications, have an over-all spiral-wound insulating covering which may be easily stripped for splicing. The method used to lock the spirally wound armor is said materially to reduce the resistance of the armor and provides an improved ground. A bushing is provided for insertion between the armor and the conductors where the cable is cut to prevent the sharp edges cutting into the insulation and short circuiting the conductors. The cable is manufactured with single and double strip armor and with one to four conductors. It is designed for use in damp places and certain sizes can be furnished with a lead sheath between the armor and the conductors.

THE GENERAL ELECTRIC COMPANY, merchandise department, Bridgeport, Conn., is manufacturing lampholders for mogul prefocusing lamps; that is, for tubular lamps with special base to assure correct focusing in stereopticon and small motion-picture projectors.

Electrical Patents

Announced by U. S. Patent Office

(Issued Oct. 9, 1928)

1,686,637. ALTERNATING-CURRENT MOTOR; L. M. Perkins, Wilkinsburg, Pa. App. filed April 24, 1925.

1,686,638. SLIP INDICATOR; R. T. Pierce, Swissvale, Pa. App. filed March 24, 1921.

1,686,639. ELECTRICAL MEASURING INSTRUMENT; R. T. Pierce, East Pittsburgh, Pa. App. filed May 12, 1923.

1,686,641. WATTHOUR METER; A. R. Rutter, East Pittsburgh, Pa. App. filed Oct. 16, 1925.

1,686,643. CONTACT FINGER; O. P. Schuster, North Irwin, Pa. App. filed Aug. 7, 1926.

1,686,652. ELECTRICAL MEASURING INSTRUMENT; J. H. Cone, Roseland, N. J. App. filed Oct. 20, 1927.

1,686,653. ELECTRICAL PROTECTIVE RELAY; L. N. Crichton, Wilkinsburg, Pa. App. filed May 26, 1923.

1,686,663. LAMP FIXTURE; J. T. Holmes, Jamaica, N. Y. App. filed Dec. 30, 1926.

1,686,666. MOTOR-CONTROL SYSTEM; H. D. James, Edgewood, Pa. App. filed Aug. 25, 1925.

1,686,669. ELECTRICAL MEASURING INSTRUMENT; J. W. Legg, Wilkinsburg, Pa. App. filed Sept. 26, 1925.

1,686,674. SUPPORT FOR ELECTRICAL APPARATUS; L. Larsen, East Orange, N. J. App. filed Dec. 26, 1924.

1,686,676. METHOD OF AND APPARATUS FOR TESTING MAGNETIZABLE OBJECTS; M. E. Berlowitz, Belleville, N. J. App. filed April 25, 1924.

1,686,678. FLEXIBLE-CABLE ADJUSTER; W. T. Burke, Chicago, Ill. App. filed Aug. 11, 1923.

1,686,679. APPARATUS FOR TESTING MAGNETIZABLE OBJECTS; C. W. Burrows, New York, N. Y. App. filed Oct. 25, 1923.

1,686,683. SWITCHING MECHANISM; W. A. Daly, Yonkers, N. Y. App. filed Feb. 27, 1925.

1,686,684. CONTROL SYSTEM FOR ELEVATORS; L. I. Davis, New York, N. Y. App. filed Oct. 29, 1925.

1,686,686. IGNITION TIMER; T. A. Edison, Jr., Orange, N. J. App. filed Oct. 19, 1922.

1,686,689. VOLTMETER; C. LeG. Fortescue, Pittsburgh, Pa. App. filed May 15, 1924.

1,686,693. SIGNAL MEANS FOR ELEVATORS, ETC.; W. H. Grover, Maumee, and C. E. Merritt and W. S. Pooley, Toledo, Ohio. App. filed Aug. 8, 1921.

1,686,699. ROTOR FOR INDUCTION MOTORS; F. P. Lauffer, Irwin, and S. C. Hoey, Wilkinsburg, Pa. App. filed March 29, 1924.

1,686,706. SWITCH MECHANISM; J. B. MacNeill, Wilkinsburg and A. H. Bakken and C. A. Tucker, Edgewood, Pa. App. filed Nov. 2, 1924.

1,686,712. ELECTRICAL MEASURING INSTRUMENT; A. R. Rutter, Forest Hills, Pa. App. filed March 12, 1926.

1,686,717. METERING PANEL BOARD; A. C. McWilliams, Chicago, Ill. App. filed May 9, 1921.

1,686,721. SWITCH-OPERATING MECHANISM; C. Aalborg, Pittsburgh, Pa. App. filed March 15, 1922.

1,686,727. ELECTRICAL MEASURING INSTRUMENT; W. M. Bradshaw, Wilkinsburg, Pa. App. filed Aug. 20, 1924.

1,686,734. CABLE HOOK; M. Cox, Stollings, W. Va. App. filed Jan. 21, 1925.

1,686,753. MOTOR CONTROLLER; R. G. Lockett, Milwaukee, Wis. App. filed Dec. 31, 1926.

1,686,772. MOTOR STARTER; E. W. Seeger, Milwaukee, Wis. App. filed April 23, 1923.

1,686,782. ELECTRICAL CABLE; H. V. Wodtke, Buffalo, N. Y. App. filed Oct. 14, 1922.

1,686,795. ELECTRIC HEATING UNIT AND METHOD OF FORMING AND ASSEMBLING SAME; E. R. Case, Toronto, Ont., Can. App. filed Dec. 12, 1924.

1,686,796. SUPPORT FOR ELECTRIC RESISTANCE ELEMENTS; E. R. Case, Toronto, Ont., Can. App. filed Aug. 20, 1925.

1,686,813. SOCKET SHELL; H. Hubbell, Bridgeport, Conn. App. filed Sept. 29, 1923.

1,686,815. METHOD OF TESTING MAGNETIZABLE OBJECTS; E. S. Imes, Jersey City, N. J. App. filed May 26, 1925.

1,686,817. TERMINAL PROTECTOR FOR STORAGE BATTERIES; J. A. Johnson, Taft, Calif. App. filed Jan. 31, 1927.

1,686,842. ELECTRICAL CONNECTER; F. J. Bullivant, St. Louis, Mo. App. filed Dec. 17, 1924.

1,686,850. TRAFFIC SIGNAL; R. French, Washington, D. C. App. filed Sept. 27, 1924.

1,686,851. DOOR-OPERATING MECHANISM; C. W. Gorman, Muskogee, Okla. App. filed April 2, 1925.

1,686,852. ELECTRIC SWITCH; C. W. Gorman, Muskogee, Okla. App. filed April 2, 1925.

1,686,860. ELECTRICAL HEATER; J. H. Hussey, Spokane, Wash. App. filed Sept. 13, 1927.

1,686,868. ELECTRIC HEATER; H. G. Landis, San Francisco, Calif. App. filed Nov. 2, 1925.

1,686,939. MEANS FOR REGULATING ALTERNATING CURRENT; C. E. Stryker, North Chicago, Ill. App. filed Jan. 31, 1927.

1,686,948. MOTOR-CONTROL SYSTEM; E. M. Bouton, East Pittsburgh, Pa. App. filed July 27, 1922.

1,687,013. ARMORED ELECTRIC CABLE; O. A. Frederickson, Wethersfield, Conn., App. filed Dec. 7, 1927.

1,687,017. APPARATUS FOR CAUSING INTERMITTENT OPERATION; L. O. Grondahl, Pittsburgh, Pa. App. filed Sept. 27, 1922.

1,687,025. ELECTRICALLY-HEATED KILN; G. Keller, Brugg, Switzerland. App. filed Dec. 13, 1926.

1,687,037. INDICATING FUSE PLUG; J. F. Orlando, Washington, D. C. App. filed May 1, 1926.

1,687,039. MOTOR FOR DRIVING HYDRO-EXTRACTORS; H. A. Romp, Arnhem, Netherlands. App. filed May 3, 1926.

1,687,040. IGNITION DEVICE; W. D. Schrope, Anderson, Ind. App. filed Aug. 2, 1926.

1,687,045. MULTISPEED VARIABLE-SIGNAL TRANSMITTER; N. H. Suren, Needham, Mass. App. filed Aug. 4, 1924.

1,687,051. ELECTRIC BATTERY OF THE LECLANCHÉ TYPE; G. N. Antonoff, London, England. App. filed May 26, 1924.

1,687,056. PROCESS OF ELECTROLYTICALLY SEPARATING THE ALLOYS OF SILVER WITH OTHER PRECIOUS OR BASE METALS; R. Carl, Vienna, Austria. App. filed July 27, 1923.

1,687,074. ELECTRICAL COUPLING; A. Wichert, Mannheim, Germany. App. filed Sept. 20, 1926.

1,687,081. APPARATUS FOR CUTTING OR WELDING METAL; R. E. Chapman, Miami, Fla. App. filed Oct. 9, 1925.

1,687,084. SAFETY DEVICE FOR TRACTION OPERATION; A. Couwenhoven, Baden, Switzerland. App. filed March 4, 1926.

1,687,088. SAFETY DEVICE FOR TRACTION OPERATION; P. Ferrari, Milan, Italy. App. filed Sept. 24, 1926.

1,687,165. ELECTRIC-SWITCH BOX; H. E. Leppert, New Britain, Conn. App. filed July 11, 1925.

1,687,167. CONNECTING PLUG; R. M. Mann, Nyack, N. Y. App. filed March 18, 1926.

1,687,183. TRAFFIC SIGNAL; B. C. Smith and T. H. Chandler, Long Beach, Calif. App. filed June 17, 1925.

1,687,196. BATTERY HEATER; C. R. Daellenbach, Ellwood City, Pa. App. filed April 1, 1927.

1,687,199. ELECTRIC SWITCH; B. E. Getchell, Plainville, Conn. App. filed April 13, 1926.

1,687,230. THERMOSTAT; W. J. Smith, Cleveland, Ohio. App. filed Au-. 24, 1926.

1,687,232. FUSE; A. G. Steinmayer, Milwaukee, Wis. App. filed Aug. 19, 1927.

1,687,233. DYNAMO-ELECTRIC MACHINE; H. M. Stoller, Mountain Lakes, N. J. App. filed June 8, 1923.

1,687,234. THERMIONIC PEAK VOLTMETER; D. M. Terry, New York, N. Y. App. filed June 10, 1926.

1,687,246. RENEWABLE FUSE; J. H. Hickey, San Francisco, Calif. App. filed Aug. 5, 1926.

1,687,247. REFILLABLE FUSE; J. H. Hickey, San Francisco, Calif. App. filed Sept. 29, 1926.

1,687,254. MULTIGAP LIGHTNING ARRESTER; J. R. McFarlin, Philadelphia, Pa. App. filed Jan. 11, 1922.

1,687,262. BATTERY-TERMINAL ADAPTER; V. V. Vaughn, Los Angeles, Calif. App. filed June 8, 1927.

1,687,297. RAIL BOND; C. L. Larson, Worcester, Mass. App. filed Jan. 12, 1927.

1,687,298. ELECTRIC COIL CONSTRUCTION; M. Latour, Paris, France. App. filed May 17, 1923.

1,687,307. BATTERY, ELECTRIC ACCUMULATOR AND ELECTROLYZING APPARATUS; R. Oppenheim, Levallois-Perret, France. App. filed Sept. 30, 1925.

1,687,311. COMPENSATED ALTERNATE-CURRENT MACHINE; R. Richter, Durlach and W. Sarfert, Dresden, Germany. App. filed April 1, 1925.

1,687,319. ELECTRICAL PANEL BOARD; F. L. Benzon, Plainville, Conn. App. filed Jan. 20, 1923.

1,687,357. RHEOSTAT; G. H. Whittingham, Baltimore, Md. App. filed March 23. 1925.

New Trade Literature

EQUIPMENT FOR BUILDINGS. — Bulletin WP-1003 issued by the Worthington Pump & Machinery Corporation, 2 Park Avenue, New York City, describes and illustrates the Worthington apparatus used in the mechanical equipment of buildings. The bulletin contains many illustrations showing typical installations.

ELECTRIC HEAT.—"Electric Heat in General Electric Factories" is the title of bulletin GEA-1012 issued by the General Electric Company, Schenectady, N. Y., in which it calls attention to the service electric heat is performing in every industry. The bulletin describes and illustrates some of the typical installations and processes in General Electric factories.

ANCHORS.—The W. N. Matthews Corporation, 3722 Forest Park Boulevard, St. Louis, has issued a new price sheet covering its new preheated certified malleable "Scrulix" anchors.

MOTORS AND SILENT GEARS.—Bulletins GEA-40A and GEA-78A issued by the General Electric Company, Schenectady, N. Y., describe and illustrate the GE-265-A 600-volt railway motor and type MTC and type MQC form GL crane and hoist motors, "5900 series." The company also is distributing bulletin GEA-482A covering its "Fabroil" and "Textolite" silent gears used with high-speed machinery. This bulletin contains tables and application data with reference to duty.

HEATERS.—The B. F. Sturtevant Company, Hyde Park, Boston, has issued catalog No. 363 describing and illustrating the Sturtevant tempervane heating units. The catalog calls attention to the advantages of tempervane heaters and contains charts for calculation of any condition that will be met and for selecting the proper size of heating unit.

ELECTRICAL MEASURING INSTRUMENT.—Bulletin No. 434 issued by the Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, describes and illustrates the students' Kelvin bridge, an instrument for teaching the Kelvin bridge method for measuring low electrical resistances accurately.

LIGHTING DATA.—The National Lamp Works of the General Electric Company, Nela Park, Cleveland, is distributing booklets C-5 and X-3 covering lighting for the stage and the lighting of airway roof signs.

TRANSMITTING AND RECORDING SYSTEM.—Catalog No. 1900 issued by the Bristol Company, Waterbury, Conn., covers Bristol's long-distance electric transmitting and recording system. The bulletin describes and illustrates the various equipment used, together with typical recording charts. The company also has issued a price sheet for use with the catalog.

WOOD TREATING. — The Curtin-Howe Corporation, timber preservation engineers, 11 Park Place, New York City, has issued a booklet descriptive of the technical problem of wood-pole preservation by the "Zinc Meta Arsenite" process. This includes the chemical reactions of wood-destroying fungi; chemistry and toxicity data, and weathering and field tests.

FASTENER.—Bulletin 2114 issued by the Crouse-Hinds Company, Syracuse, N. Y., describes and illustrates the wedge-nut fastener.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Montevideo, Uruguay (No. 33,919), of electrical massage apparatus and vibrators.

Purchase and agency are desired in Medallin, Colombia (No. 33,938), for moving electric signs.

Purchase is desired in Riviere du Loup, Canada (No. 33,888), of turbine and generator for hydro-electric development.

Purchase or agency is desired in Budapest, Hungary (No. 33,843), for quartz X-ray and violet ray apparatus.